FEBRUARY 1949

Plant Engineering

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Volume 3, No. 2

The magazine that helps plant engineers with their everyday problems

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the ONLY fully adjustable line of threaders

The new Beaver 26-R is a great advancement over the "old No. 26" . . . the original 1 to 2-inch self-contained fully-adjustable pipe threader—which has been popular all over the world for the past 40 years.

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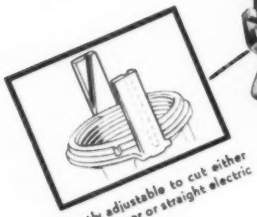
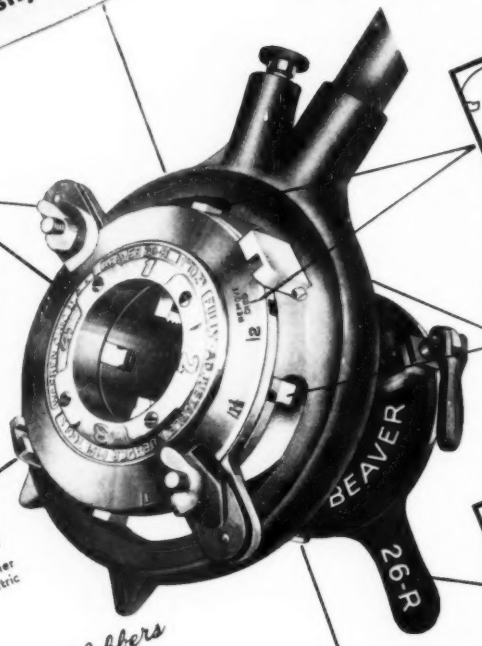
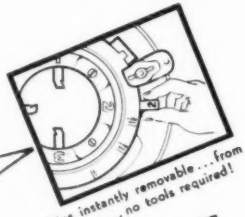


Instantly adjustable to cut either standard taper or straight electric conduit threads.





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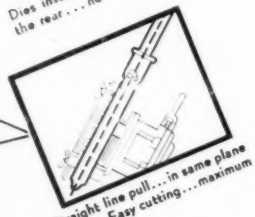

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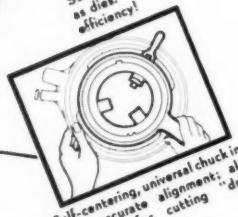

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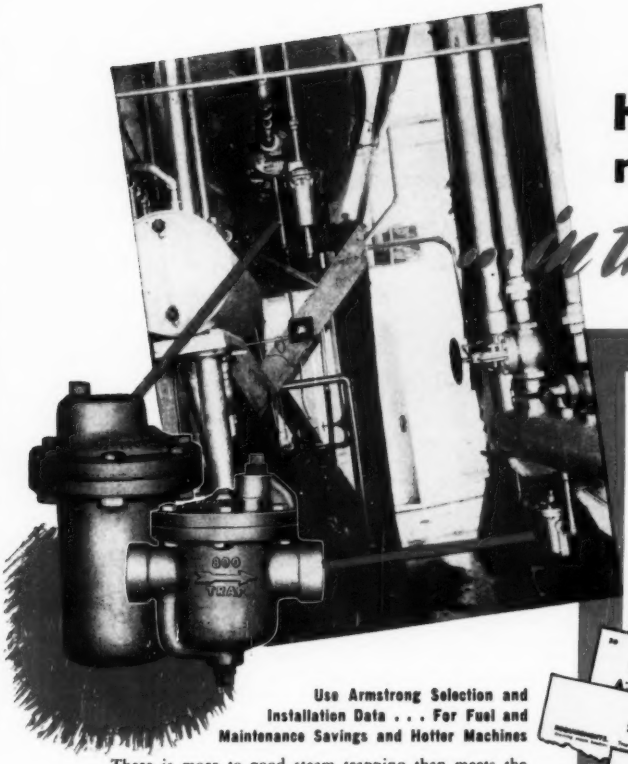
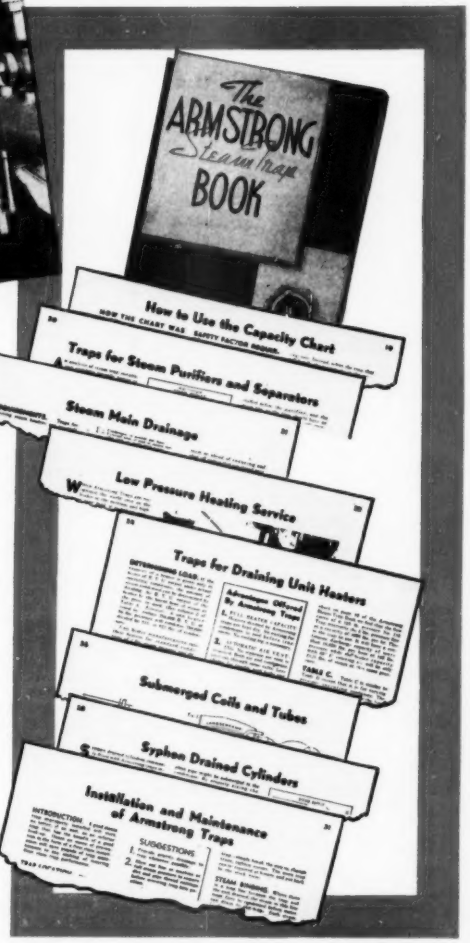


How to get the right steam trap *in the right place!*


The ARMSTRONG Steam Trap BOOK
How to Use the Capacity Chart
Traps for Steam Purifiers and Separators
Steam Main Drainage
Low Pressure Heating Service
Traps for Draining Unit Heaters
Submerged Coils and Tubes
Syphon Drained Cylinders
Installation and Maintenance of Armstrong Traps

Use Armstrong Selection and Installation Data . . . For Fuel and Maintenance Savings and Hotter Machines

There is more to good steam trapping than meets the eye. For example, intelligent trap selection involves not only the normal condensate load but must take into account peak load and the amount of air to be handled as well. The Armstrong Steam Trap Book tells how to figure condensate loads, what to do about large amounts of air and how to determine trap capacity needed for various services. It follows up with actual hot-condensate capacities of Armstrong traps. (Some trap capacity figures are based on cold water ratings, misleading because any trap will handle more cold water than it will hot condensate).

Then, because a properly selected trap won't function efficiently if it is not correctly installed, The Armstrong Steam Trap Book provides complete data on installation practice. But, even the Steam Trap Book can't think of *everything*, so the Armstrong factory and trained sales representatives stand ready to give you a lift on the really tough trapping problems.

These are a few of the reasons why Armstrong traps can be sold on a basis of "COMPLETE SATISFACTION OR YOUR MONEY BACK."

Send for a copy of the Steam Trap Book and plan now to modernize your condensate drainage system with Armstrong traps.

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PLANT ENGINEERING

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Subscription Information—Published Monthly. Prices: United States and Possessions one year $10.00, Canada one year $11.00. Other countries one year $12.00. Single copies $1.00.

'Round About with the Editors

Attractive Industrial Grounds

UPON READING Mr. Laurence's article "How to Have Attractive Lawns" on page 27 of the August issue, I automatically underlined some of the material. I want to express my whole-hearted agreement on the subject and the benefits of attractive industrial grounds.

As to the gravel and stone for paths and driveways, it would seem that hard surfaced traffic lanes are more permanent and satisfactory in the long run. The initial cost is higher but permanency and ease of maintenance should also be considered. I agree that in the case of new, small industries the more inexpensive gravel or stone may have to be used.

I am enclosing a copy of one of our Sanitation News Letters which pertains to industrial grounds maintenance. It is hoped that this will help to further accentuate the advantages of industrial horticultural projects.

Arthur C. Stone
Director of Grounds
Joseph E. Seagram & Sons, Inc.
Louisville, Kentucky

EDITOR'S NOTE: *The Sanitation News Letter referred to the above is Volume II, Number 20, entitled "Industrial Landscaping and Grounds Maintenance." This is a 3 p bulletin, which outlines the advantages of pleasant industrial environment; gives examples of well kept grounds; and has many practical pointers on landscaping and the location and layout of access walks. Plant engineers with a further interest in this subject should contact Mr. Stone.*

Mr. Stone is also Secretary-Treasurer of the newly formed Association Of Horticulturists in Industry. The A.H.I. was organized to further development on industrial premises and promote better grounds maintenance. There are three types of membership in the association. Individual membership with dues of $5.00 a year; corporate or company membership with dues of $25.00 a year; supporting membership of $100.00 or more.

The new Association held a meeting in New York last March and another one in Ithica in November.

The association is interested in promoting membership of individuals responsible for grounds maintenance. Those interested should contact Mr. Stone direct.

To Those Who Come To See Us

BY AND LARGE visitors have a tough time. Strange cities, difficult transportation, contacts with strange and busy people, and worry about where to sleep and where to eat.

Each visitor to the Clinton Industries, Inc. plant at Clinton, Iowa, receives a little booklet, titled as above, which helps make strangers feel at home. The first paragraph is:

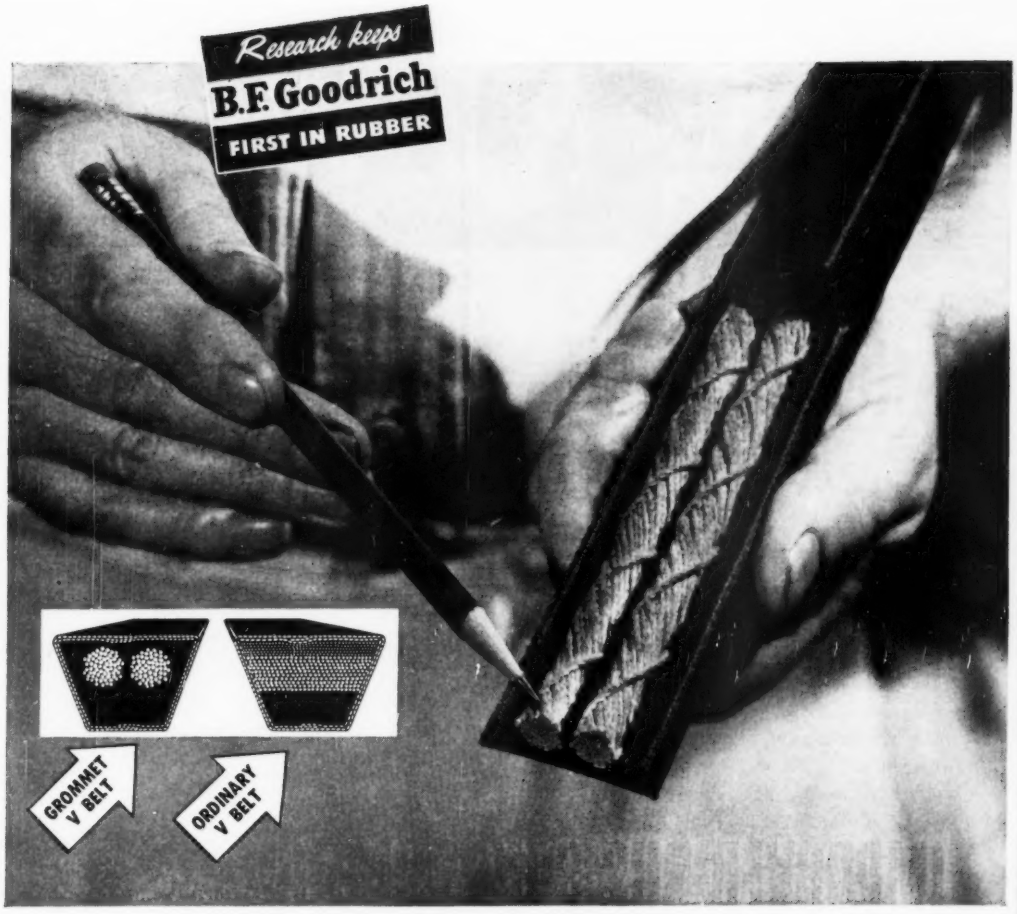
"By coming here personally to present the story of your product or service, you and your company are making it easier and more pleasant for us to conduct our business." The last paragraph is: "We hope your stay in Clinton will be pleasant and satisfactory. If you do not get what you came for, we know how you feel, as our own representatives have the same problem. Your management and ours appreciates the situations which are met from day to day. It is to our mutual benefit to have an interest in your business and the products manufactured and for you to have an interest in our business and our products."

Between these two paragraphs the book is filled with pertinent data: office hours of different departments; the best time to make calls: a short history of the company; a list of company personnel arranged by departments; transportation schedules; taxicab numbers; hotels; other important industries in Clinton; and, a list of the company's products all made from corn.

Receptionists are qualified information bureaus. They are courteous and helpful, arrange interviews, make reservations, help with telephone calls and arrange transportation. "Many miles we've traveled, 10,000 miles or more" but the little booklet makes Clinton, Ia., and the Clinton Industries in particular, seem like an old friend that we'd like to go back to see. The booklet is something that thousands of companies could copy to the advantage of their industrial and public relations programs.

AMERICA is said to use 700 million dollars worth of lubricants annually. This quantity of oil is almost equally divided between industry in general and automobiles.

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A. $11.00 to Canada. $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.



This V belt will cut your belt costs 20% to 50%

Only B.F.Goodrich makes the grommet belt—there's no other like it

THE B.F.Goodrich patented grommet belt lasts 20 to 50 per cent longer but costs no more than an ordinary V belt.

A grommet is *not a cable*. It is made by winding heavy cord *on itself* in an endless loop. (Cables are simply twisted cords; ends must be overlapped or spliced.)

Better than multiple cords. In a grommet belt all the cords work *all the time*. There are no cords in the *center* of the belt — which in an ordinary belt don't pull their share of the load.

More flexible. There is no splice, no stiff section where cords overlap. (85% of failures of ordinary belts occur in overlapped sections.) BFG belts have twin grommets, no fabric or plies in the middle of the belt that stiffen it and generate heat.

Stand shocks. Grommet belts run cooler, are stronger, have more *elasticity* but less *permanent* stretch than any other kind of belt. They stand sudden shock. Both laboratory and field tests have proved that they outlast all others, especially on hard drives.

Large sizes only. At present grommet belts are made only in largest sizes (D and E sections). Later, other sizes may be made.

More information. If you buy or use large-size V belts, don't do without the advantages grommet belts can give you. Talk to your BFG distributor. Or write, if you wish, for leaflet 2170. Address Dept. L-10, *The B.F.Goodrich Company, Industrial Products Division, Akron, Ohio.*

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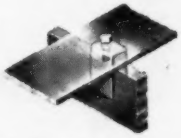
NEW RACK-OUT MECHANISM

Built-in rack-out bar and rollers provide a smooth and easy means of inserting the breaker, or withdrawing it to the test position. Thus, inspection is easy.

SAFETY INTERLOCK

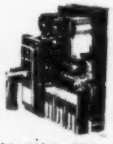
Mechanical safety interlock prevents connecting or disconnecting the new AK-1 air circuit breaker unless the breaker is in the "open," or "safe," position.

IMPROVED BUS CONSTRUCTION



Raised buses on AK-1 equipments mean longer creepage distance between phases; approximately double that of previous design. This feature cuts maintenance costs.

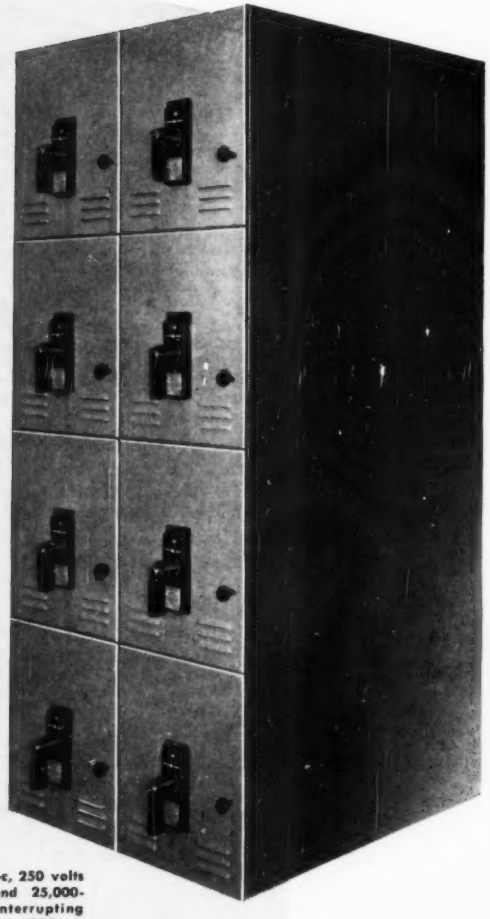
LOW INSPECTION COSTS



Breakers of the same frame size are interchangeable. For inspection, merely lift the bar and pull the breaker forward. All parts are readily accessible.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

DRAWOUT SWITCHGEAR



600 volts a-c, 250 volts d-c; 15- and 25,000-amperes interrupting ratings; 15 to 225, or 35 to 600 amperes.

WITH THE NEW AK-1 AIR CIRCUIT BREAKER FOR COMPLETE PROTECTION ON LOW-VOLTAGE SYSTEMS

These attractive new metal-enclosed units require less floor space than previous designs. Also, you now get four breakers—in the same height—where three were before . . . And you get plenty of "IC" (interrupting capacity) for the protection of your production, equipment, and personnel . . .With this new drawout switchgear you can set up completely selective power distribution systems that will eliminate costly production shutdowns caused by unnecessary main breaker tripping . . . Specify *this* switchgear *now* from your G-E sales representative. Write for bulletins GEA-4951 and 4966. "Selective Operation" is described in GET-1485. *Apparatus Department, General Electric Company, Schenectady 5, N.Y.*

GENERAL ELECTRIC

Plant Engineer's Digest

Short articles selected from current publications and condensed for quick reading to save time and give quick reviews of a wide range of industrial topics

Installation of Overhead Tracks

OVERHEAD tracking is a vital accessory for cold rooms built for the storage of heavy, cumbersome foodstuffs. Installed extensively in locker plants, slaughterhouses and cold storage warehouses, tramrail equipment not only offers many labor saving advantages, but also affords one of the most practical and efficient

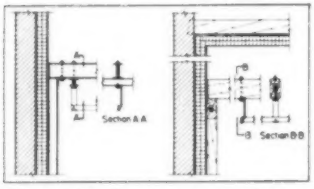


Fig. 1. This drawing shows details of track supported by wood or steel structures in the cold room

methods of storing maximum amounts of produce within minimum cold storage space.

Two things are vital to the proper installation of tramrails: adequate support and space. If there is no provision for these two requirements, the tramrail installer is forced to bend and crimp on the job, improvising an arrangement to meet the already existing building construction.

This runs up cost and seldom results in the most efficient tracking arrangement. Furthermore, a little consultation between sub-contractors as the work progresses can be of mutual advantage to all concerned. For example, the tramrail hangers can often be used for dual purposes. In addition to tracking, these hangers can be used to support

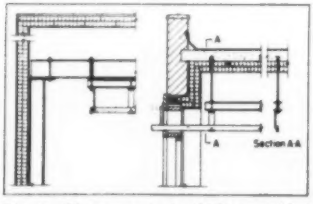


Fig. 2. The support should be provided by a structural framework erected within the insulated room

evaporator coils and other refrigerating equipment. This minimizes the puncturing of the insulation envelope, which is one of the insulating contractor's foremost considerations for a clean-cut and efficient insulation job.

During its extensive application, there is little which the tramrail installer regards as standard installation practice. Every tracking job is virtually custom-built to meet the needs of the cold storage room involved. It is, therefore, very important that the proper data be submitted to the contractor before the equipment is ordered and fabricated at the factory. A brief description of these various considerations is presented below. They are accompanied by diagrams selected from actual installations made recently by the Philadelphia Tramrail Company.

Wood or Steel Supports—Strong structural ceiling supports such as shown in Fig. 1 are needed to carry overhead tramrail loads. The strength of these supporting members can be varied with the width of the ceiling span involved with a

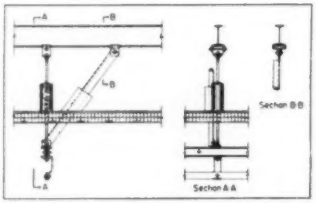


Fig. 3. Shown in this sketch are methods of false ceiling construction which can often be used to good advantage

relative weight of the produce to be stored. Wood beams are used most commonly to support tramrail loads. Wood is less expensive than steel and does not require the special skill and tools required for the installation of structural steel.

Steel, on the other hand, is more durable than wood and is therefore used to best advantage in low-temperature rooms where moisture is a problem. Properly specified fabricated steel beams, in the hands of competent mechanics, are actually installed quicker than wooden supports. In fact, labor savings realized by the erection of steel will invariably make up the difference in

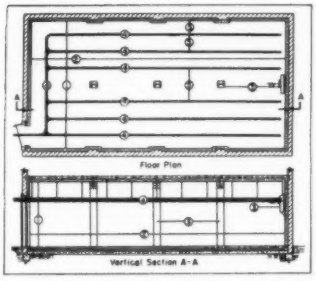


Fig. 4. Diagrams of overhead track systems are usually provided by competent engineers in manufacturers' or contractors' offices

cost between the steel and wood.

Internal or External—Wherever possible, tramrail support should be provided by a structural framework erected within the insulated room and entirely independent of the building structure. Such internal support places all of the weight on the cold room floor, and maintenance and repair are then readily accomplished.

An external supporting framework is the alternative method. This can be in the form of: 1. Adequate beams strong enough to carry tramrail loads constructed within the ceiling itself; 2. ceiling beams supported at each end by the wall construction; and 3. a supporting framework erected entirely outside the cold room. In a majority of instances, these external methods of tramrail support make it necessary to pierce the insulation at many points. This reduces the thermal efficiency of the insulation and also opens up many places for the infiltration of moisture.

False Ceilings—A false ceiling construction can often be used to very good advantage when installing tramrail equipment. This is the one instance where overhead tracking must always be installed before the insulated ceiling is erected.

All structural bracings for the tracking should be closed off above the false ceiling, leaving only a small section of hanger and the track itself extending through the ceiling into the cold storage room. In hiding overhead rail bracings, the false ceiling not only adds to the appearance of the cold room interior but also saves the cost of refrigerating the waste ceiling space around the tramrail bracings.—*From Armstrong's Insulator, a publication of the Armstrong Cork Co., Building Materials Div., Lancaster, Pennsylvania.*

THERMOBLOC

DIRECT FIRED UNIT HEATER

...THE UNIT HEATER WITH THAT *Extra Feature*

"IMMEDIATE DELIVERY"

FROM STOCK

Before Prat-Daniel announced their New Radical Unit Heater, two important steps were taken to assure delivery . . . First—production methods on THERMOBLOC were streamlined . . . Second—an adequate stockpile of units was built up to assure delivery.

Orders rolled in almost immediately following the first announcement, and THERMOBLOCS were shipped, from stock, by "return mail".

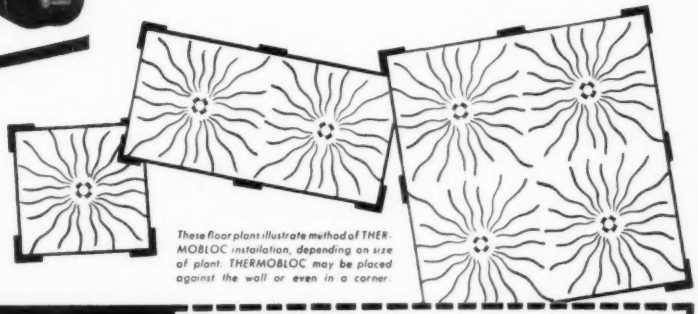
You too can avail yourself of this "quick service", on the most revolutionary unit heater yet developed. Small in size, only a 30" diameter floor space required for the largest unit, the THERMOBLOC 550 delivers 550,000 b.t.u.'s per hour, and the NEW THERMOBLOC 300 provides 300,000 b.t.u.'s per hour, both at an efficiency of from 82-86% with #3 oil or gas.

THERMOBLOC provides draft-free heated air at working level and may be used as a circulator of cool air, drawn from the floor level, in the summer.

Fully automatic, THERMOBLOC requires no attendant. Packaged design offers a complete unit requiring only connection of power and fuel lines for installation. You save excessive installation costs.

When used as original heating installation, any number of THERMOBLOCS may be placed throughout the plant as required. This unit is ideal as a supplement to your present system, for heating that "cold spot".

Information on other applications such as drying will be gladly sent. Ask for catalog #300.



These floor plans illustrate method of THERMOBLOC installation, depending on size of plant. THERMOBLOC may be placed against the wall or even in a corner.

THERMOBLOC DIVISION

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I would like to have further information on the New Thermobloc Unit Heater. My heating requirements are sq. ft. floor space.

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Reduced Costs of Materials Handling

PRIOR TO THE installation of a palletization program for the effective handling of raw materials used by the manufacturing departments of the Sherwin-Williams Paint Company, Chicago, elevator operators performed a function of elevator operation only. The conversion from the use of four-wheel and two-wheel hand trucks, to electric and hand pallet trucks placed the elevator operators in an ideal position to give valuable assistance in the transfer of palletized materials from the unloading floors to storage location on upper floors.

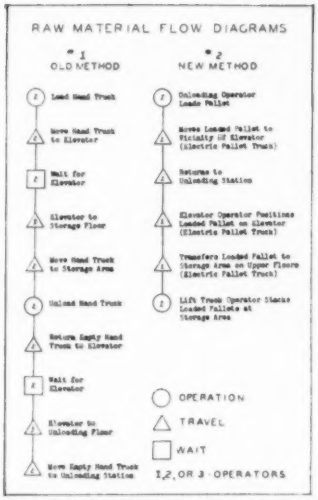
The old method, as shown in Diagram 1, required two unloading operators to move the loaded hand truck to the storage areas on the upper floors. Elevator delay time was as much as 25 per cent of the total cycle time and the materials were hand unloaded at the storage areas.

One unloading operator is required by the present method, Diagram 2. The loaded pallet is transferred from the unloading station to the vicinity of the elevator by means of an electric pallet truck. The pallet load is released near the elevator and the unloading operator returns to the unloading station.

Between service to other material movements, the elevator operator loads the full pallet on the elevator by means of an electric pallet truck. This operator transfers the pallet load of materials from the unloading floors to the storage locations on the upper floors. Gasoline lift trucks are used to stack the loaded pallets at the storage locations.

When low capacity elevators are used which will not safely carry the equipment plus a pallet load of material, the unloading operator places the full pallet on the elevator at the unloading floor. Only the rear wheels of the electric pallet truck are allowed to enter the elevator thereby keeping the load weight below the elevator capacity. The unloading operator returns to the unloading station and the elevator operator moves to the upper storage floors where an electric pallet truck is provided for him to transfer the loaded pallet from the elevator to storage. In order to avoid unloading the elevator, only the rear wheels of the electric pallet truck are allowed to enter the elevator when unloading at the storage floors.

In those areas where electric pallet trucks are not allowed because of the fire hazard, hand pallet trucks are used. The more effective use of the elevator operator's time and the conversion to pallets and pallet handling equipment has resulted in a 40 per cent reduction of material handling costs. *By Francis V. Herr, in Materials Handling Institute Chapter Bulletin, a publication of the Materials Handling Institute, Pittsburgh, Pennsylvania.*


RAW MATERIAL FLOW DIAGRAMS
1
OLD METHOD
2
NEW METHOD
Load Hand Truck
Move Hand Truck to Elevator
Wait for Elevator
Elevator to Storage Floor
Move Hand Truck to Storage Area
Unload Hand Truck
Return Empty Hand Truck to Elevator
Wait for Elevator
Elevator to Unloading Floor
Move Empty Hand Truck to Unloading Station
Unloading Operator Loads Pallet
Move Loaded Pallet to Vicinity of Elevator (Electric Pallet Truck)
Returns to Unloading Station
Elevator Operator Positions Loaded Pallet on Elevator (Electric Pallet Truck)
Transfers Loaded Pallet to Storage Area on Upper Floors (Electric Pallet Truck)
Lift Truck Operator Stacks Loaded Pallets at Storage Area
OPERATION
TRAVEL
WAIT
1,2, OR 3 OPERATORS

These two raw material flow diagrams show the reduced number of operations at one point in the handling of raw materials at Sherwin-Williams Co.

Hazards in Plant Maintenance

IN REPAIR WORK on electrical circuits, there is always the hazard of electrocution or from traumatic injury due to being caught by machinery started unexpectedly. Positive measures are necessary to prevent the unexpected energizing of the circuit. The best method is to arrange control switches so that they may be locked in the open position with the key in the possession of the person doing the work so that only he, or a person specifically designated by him, can remove the lock and close the switch. In case two or more persons may be exposed, the group leader should be given the responsibility of attaching the lock and removing it only when it is entirely safe to do so.

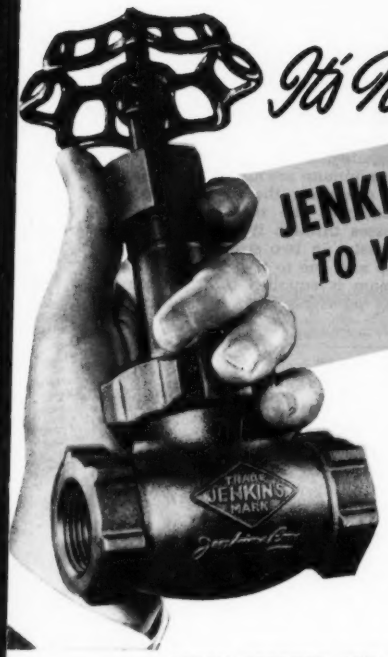
In many plants a tag is placed on the open switch to show that men are at work on the equipment, but this is not as reliable as the use of locks, and it is not recommended as a substitute. An even less reliable device is to block the switch open with a piece of wood. Even stationing a person at the switch with instructions to close it on signal is not always reliable because such signals can be misinterpreted and also, unless the person in charge is very careful to impress upon all concerned the importance of great care in such operations, unexpected slips are likely to occur with fatal results.

The planning for a given job will include, of course, decision as to what, if any, protective equipment is needed such as rubber gloves, insulating mats and the like, goggles or masks to give protection against flying objects or flashes, screens to protect others against flashes from arc welding or from flying particles if chipping or drilling is involved, and properly safeguarded extension lights. All of this material should be assembled at the start of each job and checked to make sure that it is in proper condition and available as needed.

The maintenance of electrical equipment in operating condition involves a substantial amount of routine testing and inspection. The effectiveness of the grounding of such equipment should be checked on a regular schedule depending upon conditions and the type of equipment involved. Control devices such as circuit break switches require frequent inspections. Grounds —particularly those inside—should be checked for evidences of mechanical injury or corrosion. Earthed or driven grounds outside may lose their effectiveness in spells of dry weather, hence they should be checked at such times. The hazard factor is always present in work of this sort because there is always the danger of contact with uninsulated current-carrying parts and there is always the possibility of a part that is presumably grounded losing its ground and becoming live through an insulation failure. Safety in this work lies in the careful detailing of correct procedures for all conditions involved and the faithful adherence to these procedures.

One source of difficulty, which is really more of a fire hazard than one of direct bodily injury, results from the overfusing of circuits by unauthorized persons. If, due to overloading, fuses blow or circuit breakers operate frequently, the process workers are likely to try to bridge them by various means. This causes overheating, burnouts, fires and the failure of insulation. The remedy is to provide circuits of sufficient capacity for the maximum loads that will normally be placed upon them, and in addition it is frequently advisable to provide locked fuse boxes to prevent tampering by unauthorized persons.

Particular attention should be paid to the hand tools used on electrical work. So far as possible, handles of such tools should be of insulated material or protected by effective insulation. For example, many electricians bind the handles of their



It's New!

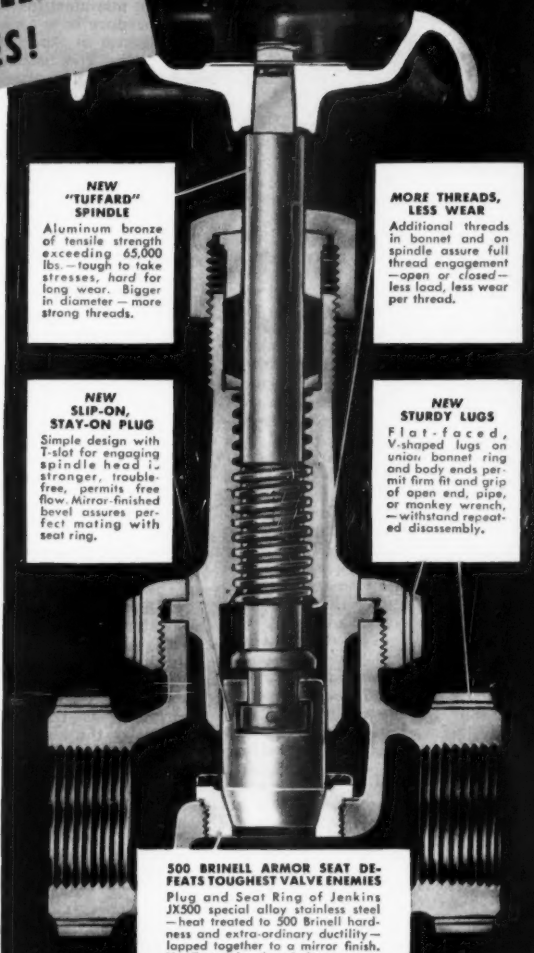
JENKINS ANSWER TO VALVE-KILLING SERVICES!

JENKINS Fig. 976-A

PLUG TYPE

Armor Seat

BRONZE GLOBE VALVE



NEW "TUFFARD" SPINDLE

Aluminum bronze of tensile strength exceeding 65,000 lbs.—tough to take stresses, *hard* for long wear. Bigger in diameter—more strong threads.

MORE THREADS, LESS WEAR

Additional threads in bonnet and on spindle assure full thread engagement—open or closed—less load, less wear per thread.

NEW SLIP-ON, STAY-ON PLUG

Simple design with T-slot for engaging spindle head is stronger, trouble-free, permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

NEW STURDY LUGS

Flat-faced, V-shaped lugs on union bonnet ring and body ends permit firm fit and grip of open end, pipe, or monkey wrench, —withstand repeated disassembly.

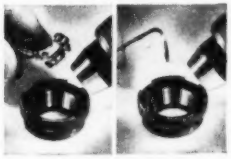
500 BRINELL ARMOR SEAT DEFEATS TOUGHEST VALVE ENEMIES

Plug and Seat Ring of Jenkins JX500 special alloy stainless steel—heat treated to 500 Brinell hardness and extra-ordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

300 lbs. Steam 600 lbs. O.W.G.

BUILT TO BREAK RECORDS FOR LONG LIFE

Now, for the most severe services, you can choose the new Jenkins Fig. 976-A with complete confidence that it will set new economy records. Use it for pressure regulation, bleeds, drips, and drains, or any close regulation of steam that threatens wire drawing. It will lower maintenance, last longer, where entrapped pipe chips, scale, or rust tubercles are a problem.



SMASHED PIPE CHIPS, WIRE, LEAVE NO SCARS

Steel pipe chips and 1/16" wire rod, with Brinell hardness in excess of 300, were crushed between the new Jenkins JX500 Plug and Seat Ring without leaving a scratch or dent. That's proof of super hardness!

Compare Fig. 976-A, part for part, and see why it's as nearly wear-proof, trouble-proof, and maintenance-free as any stock valve can be. Only a few of the dozen ways it's better are shown here. Get the complete story in the new folder. See why it's unrivalled for endurance and economy, —why it's your best buy in plug-type valves! Use coupon.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

LOOK FOR THIS TRADE JENKINS MARK DIAMOND MARK

SINCE Jenkins Bros. 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need

GET COMPLETE DETAILS—IN THIS NEW FOLDER

Mail Coupon Today!

JENKINS BROS., 80 WHITE ST., NEW YORK 13

Please send Armor Seat Valve folder—Form 193

Name .....

Company .....

Address .....

pliers with tape. This insulates and provides a better grip, and if properly maintained, is satisfactory for most conditions. It is not an adequate substitute for rubber golves in work on live circuits, but when contact is unexpectedly made with ordinary voltages, such insulation is very likely to mean the difference between a serious injury and no injury.—*From the October 1948 issue of The Locomotive, a publication of the Hartford Steam Boiler Inspection and Insurance Co., Hartford, Conn.*

Operate Lights Vertically

HIGH-PRESSURE mercury lamps, of the types commonly used for factory lighting and exterior floodlighting, produce 5 per cent more light if operated in a vertical position than in a horizontal one.

Prior to some findings made in a recent study in General Electric's Lamp Department, it was assumed that the light output of the lamps was independent of the position. New designs of the 250 and 400-watt quartz lamps, however, besides operating well in any position, have higher efficiency, are easier to maintain and have longer life than lamps of earlier designs. This is attributed to the use of larger arc tubes in which the light is produced, and to bigger outer jackets. The larger outer jackets by themselves give only slight improvement, but in combination with the larger arc tubes give a decided advantage.

Research has revealed that hydrogen causes rapid deterioration of the quartz arc tube and also makes starting difficult. This hydrogen is produced by the action of strong ultraviolet radiation from the arc tube upon vapor evolved slowly from the outer jacket walls as a result of high operating temperatures. It has been learned that hot quartz is highly porous to hydrogen but that it becomes progressively less sieve-like at lower temperatures. Investigation also revealed that jacket glasses vary greatly in the amount of water vapor they give up.

Advantage has been taken of these findings to increase the life and efficiency of the lamps. The quartz arc tube was made less susceptible to damage by hydrogen by lowering its temperature. The amount of damaging hydrogen was kept to a minimum by the use of glass which gave up the smallest possible amount of water vapor.—*From a paper presented before the annual convention of the Illuminating Engineering Society by Edward B. Noel, Lamp Development Engineer, General Electric Lamp Department, Nela Park, Cleveland, Ohio.*

Improved Digester Heating

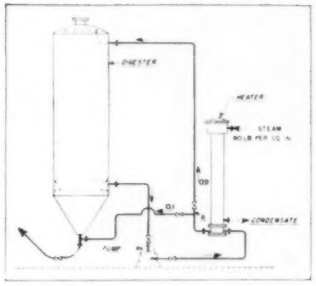
ADVANTAGES DERIVED from better methods of applying heat, while not as spectacular as other strides being taken in temperature and pressure work, are equally important. One example of the more efficient application of heat is shown in the following.

In the manufacture of newspaper the procedure is to cook wood chips in a digester in order to secure sulphite pulp. The usual practice has been to heat the charge of wood and liquor in the digester by admitting steam directly at the bottom of the charge until the desired pressure and temperature were obtained, and holding the heated condition until the batch was cooked. This method was subject to material improvement.

In the first place, the point of steam admission would be the hottest due to irregular circulation and an uneven temperature condition would prevail throughout the charge. Thus the quality of the product could not be homogeneous. The introduction of steam results in condensation and dilution of the liquor. Consequently the initial concentration would have to be very high and acid consumption would be considerable. The steam used for heating would be condensed in the liquor and would become a part of it unfit to use in the boiler feed system.

In order to improve plant performance a system for the indirect heating of digesters were developed as shown in the drawing. The principle involves cooking acid through an exterior heater and returning it to the digester. A circulating pump withdraws the acid through a screen near the bottom of the digester, pumps it through a steam heater and returns it to the digester. About 9/10ths of the acid returns through a distribution ring at the top of the digester and 1/10th at the lowest point at the bottom.

This gives a rapid continuous circulation of acid at the desired temperature and pressure. All steam condensed in the heater is pure condensate and returnable to the boilers. A minimum amount of acid is used. In operation, the liquor enters the heater at the bottom, makes two passes through it and flows to the digester in two streams, one to the top and one to the bottom. Heating steam is supplied to the heater at 110 psi. This raises the liquor and



Schematic diagram for the indirect heating of digesters. The cooking liquid passes through the exterior heater and is returned to the digester

wood charge to 324 F at 80 psi in 2½ hr. This condition is maintained for 2 hr longer and the final cook completed by the injection of steam directly into the digester before the contents is blown down to a diffuser.

The circulating pump handles 1500 gal of liquor per minute. This is equivalent to a velocity of 9 to 10 ft per second through the tubes, sufficient to prevent flashing of the liquor and minimize the formation of scale. *From Heat Enginering, a publication of Foster Wheeler Corp., 165 Broadway, New York City.*

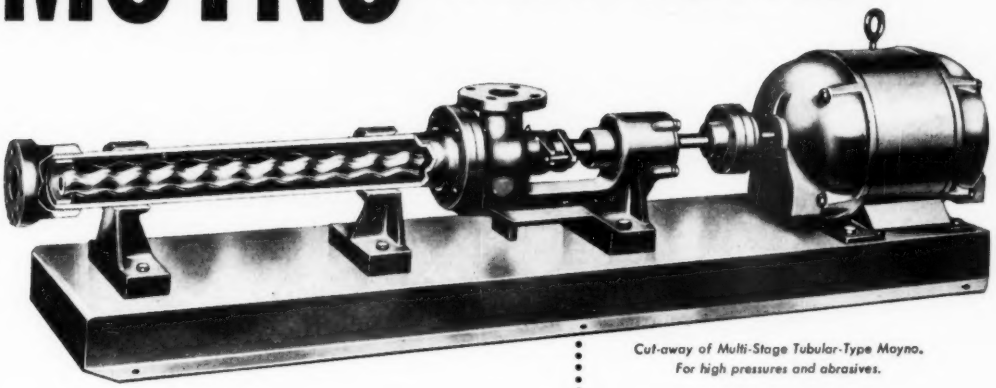
Steam Detergent Speeds Maintenance

THE STEAM DETERGENT method of cleaning may be defined as the simultaneous application of heat, impact and cleaning solution. Dies, food fats, burned-on sugars, automotive greases, syrups, oil films, soot—these and many more—can be removed with speed and thoroughness. The guns shown in the drawing are so designed that when the steam passes into the mixing chamber a strong vacuum is created which sucks up the solution and delivers it through the nozzle. The solution is heated first, simply by sticking the gun nozzle into it for a minute or two. The gun delivers a blast of solution, steam and hot water at a force sufficient to soften and remove soils in an amazingly short time. The appurtenances for this solution lifting steam gun include the regular round nozzle and fan type nozzles. The latter are used for certain cleaning jobs where it is desired to get a wider angle spray. A brush attachment model is also available for use with this gun. The brush provides the scrubbing action which is sometimes needed in certain types of cleaning work.

The proper fittings should, of course, be used and it is recommended that high quality 4-ply or 5-ply steam hose be employed. Boss

(Continued on page 16)

MOYNO THE CHOICE OF MEN WHO WANT TO FORGET ABOUT PUMPS



Cut-away of Multi-Stage Tubular-Type Moyno. For high pressures and abrasives.

The experience of thousands of Moyno users makes this a good rule to follow: if you want *dependable* pumping, get a Moyno. Robbins & Myers Moyno "Progressing-Cavity" Pumps move virtually *anything* that will push through a pipe—porcelain, solvents, starches, foods, sludges—everything from volatile liquids to non-pourable pastes. And they *keep on pumping* when others fail.

PROVED BY RESULTS

Moynos are in everyday use for making spark plug porcelain, pottery, drugs, foods . . . in paper and textile industries . . . wherever materials require pumps that *stand up.* There's nothing like the Moyno for "impossible" conditions of abrasion, viscosity, and solids in suspension. Moynos save their cost over and over again in dependable performance. For instance, at Pickard, Inc., Antioch, Ill. (makers of fine china), Moynos have pumped abrasive clay slip at 90 pounds pressure for *over seven* years, and they're *still going strong.* These pumps can save *you* money, too.

Free Book tells how . . .

A free 16-page booklet, "A Turn for the Better," explains "progressing-cavity" pumping; gives pressures, capacities, uses. Write for it—learn for yourself how Moynos are better. Just ask for Book No. P-22E.

R & M MOYNO® PROGRESSING-CAVITY PUMP

No other pump is like it!

ONLY ONE MOVING PART. A single-helical rotor turns in a double-helical stator. No pistons, no valves, no high-speed impellers.

NO CONCENTRATED WEAR. Continuous, *ever-changing* seal lines spread wear evenly over all surfaces.

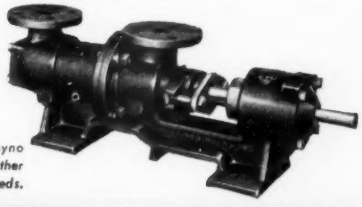
NO PULSATION. Moyno pumping is constant—delivers smooth, continuous output at pressures to 1000 p.s.i. There are no flow restrictions, no internal obstructions to cause high turbulence.

SELF-PRIMING. Moyno "progressing-cavity" pumping develops a high vacuum, requires no priming.

REVERSIBLE. Moynos work equally well in either direction. There are no troublesome end seals.

CANNOT CONTAMINATE. Bearings are *outside* the pumping compartment.

LOW MAINTENANCE. Moynos are long-lived, low-cost performers. They're easily and quickly dismantled for cleaning; seldom need more than routine maintenance.



The "Standard" Moyno for general service. Other types for specific needs.

ROBBINS & MYERS, INC. MOYNO PUMP DIVISION
Springfield 99, Ohio • Brantford, Ontario

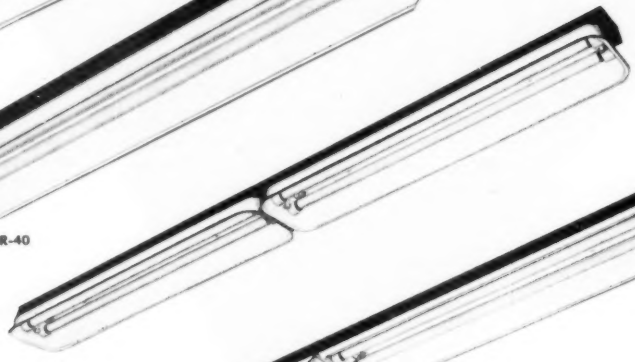
MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS • FOUNDED 1878

YOU CAN BE **SURE**.. IF IT'S

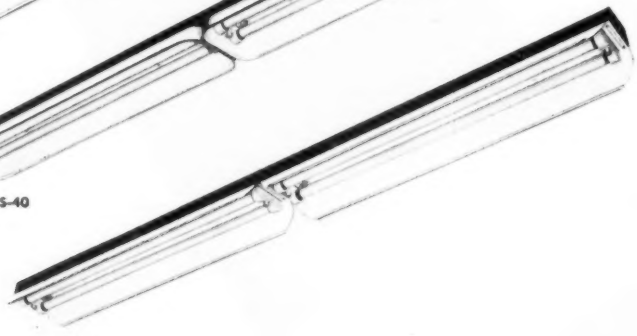
Westinghouse

2 HP-40

2 HPR-40



4 HPS-40



4 HPC-40

ANOTHER *Reason to Buy*

WESTINGHOUSE INDUSTRIAL FIXTURES

The Heavy Duty Lampholder

Announcing . . . the new push-type, twin lamp holder that radically cuts maintenance costs . . . eliminates socket replacements. Available now in the Westinghouse fixtures shown at left . . . *and at no increase in fixture price.*

The new heavy-duty holder is designed to help you sell more fixtures and increase your profits on maintenance jobs. It cuts socket replacement by eliminating breakage and chipping. Lamps can be inserted quicker—easier, and they can't fall out. Starters are housed in the lamp holder—can be changed without removing lamps. Smooth, rounded, one-piece construction makes cleaning simple.

CUTS MAINTENANCE COSTS 6 WAYS

1. The all-steel housing provides indestructible protection for the lamp holder.

2. Spring-type socket at both ends of fixture makes lamp insertion quick and simple. Lamp is guided into position by a bevelled ring guide. Once inserted, the lamp can't fall out!

3. Spring pressure at both ends of the lamp provides a "floating ride" for the lamps—minimizing the effects of shock and vibration.

4. Starters are readily accessible and can be replaced without removing lamps. Arrow on socket housing indicates lamp operated by starter.

5. Sliding action of spring contacts provides self-cleaning contact with lamp pins. A safe, positive electrical contact is assured.

6. Lamp holder wiring contacts are so arranged that connections can be made without removing unit from the fixture.

Specify Westinghouse fixtures with the new heavy-duty lamp holders. Save yourself and your customers needless maintenance expense.

For further information about the new Westinghouse line of industrial luminaires featuring the heavy-duty lamp holder, write for booklet B-4194. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

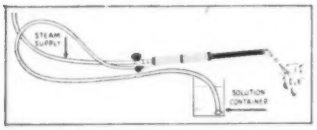
J-04202

Westinghouse

PLANNED LIGHTING PAYS

(Continued from page 12)

couplings should be used. After connections have been made and the solution prepared, open the steam valve on the gun all the way and then turn the valve at the steam gage until the pressure read 60 to 70 lb. Then, holding the gun at a 45 to 60 deg angle about 6 in. from the surface to be cleaned, open the solution valve until a sudsing circle about 12 in. in diameter is obtained. This is equivalent to a ½ to 1 gpm of steam detergent spray, which is about right for achieving good cleaning. In cleaning, the nozzle of the gun should be held about 2 to 3 in. from the work.



With this gun all you need to start steam cleaning is a steam supply at 40 psi and a pail or drum of cleaning solution. Open the valves and the steam automatically lifts the cleaning solution combining it with the steam in the nozzle. Both steam and solution can be controlled right at the gun by a turn of the valves so you can get just the right mixture

If deposits are excessively heavy, it is advisable to cover the entire area first as a pre-soak. After deposits have been removed, surfaces can be steam rinsed merely by closing the solution valve on the gun. Where steam facilities are not available, a mobile, selfcontained steam generating unit can be employed. Such a device makes steam-detergent methods practical for various industries where steam pressures are low or non-existent, or for jobs such as cleaning road construction equipment, farm machinery and other items which may be far removed from regular steam supplies.

In many plants, a multiple fixed-position steam gun installation can be very advantageous. In this case, a centrally located cleaning tank feeds as many as five or six guns in different parts of the plant. This method saves considerable time and is recommended where maintenance equipment cleaning is a daily routine such as in bottling plants, food plants, or in some textile and paper mills. These same guns are also admirably suited for stripping paint. Here the solution should be heated to 200 deg or more. About 5 to 10 lb of steam pressure is used, employing gravity solution flow or a small centrifugal pump. *From Oakite News Service, a publication of Oakite Products, Inc., New York, N. Y.*

Servicing Hydraulic Systems

THE FOLLOWING material was received from the plant superintendent of a nationally known manufacturer. This bulletin was distributed, by the company, to all department foremen, and covered the servicing of hydraulic systems.

Requirements

To operate properly in a hydraulic system an oil should: Provide just the right seal for the pump. Permit a minimum of wear on working parts. Not change in viscosity with change in temperature. Be resistant to foaming or aeration. Precipitate no gums or sludge. Have no corrosive action on metals. Retain all of its properties in use. Give a long service life.

The oils specified have been selected because of the special treatment they have received for use in hydraulic systems. Ordinary lubricating oils not receiving this special treatment are not always satisfactory, the experience shows that the use of ordinary oils may result in scored or broken pumps, gumming of control valves, sludging, high operating temperature, foaming, sticky valves, rapid wear, sluggishness when cold, and rust.

Maintenance Procedure

As experience has shown that replacement of hydraulic oil is often neglected even after long service or external contamination has rendered it unfit for further use, periodic cleaning of hydraulic systems is essential to sustain suitable operating conditions for the interior surfaces of pumps, pipelines, control valves, cylinders and reservoirs. Only in this way can full efficiency of the hydraulic system be maintained continually and shutdown be avoided.

Periodic inspection of strainers and filtering elements is important. This should be done monthly. Strainers should be cleaned. Filtering elements should be renewed, if necessary. The condition of the oil in the system should also be checked and if there is any evidence of contamination, foaming, sludge in reservoir, sticking valves or discoloration, it should be changed. Otherwise it should be changed after 5000 hours of machine operation.

Changing Oil

Cleaning: The system should be cleaned by flushing with a flushing oil which combines flushing, solvent and lubricating properties in correct proportion for the purpose.

The sequence of operations is as follows:

1. Drain the used hydraulic oil.
2. Inspect and clean the reservoir. Use gum solvent flushing and a brush to clean sides and bottom. Do not use a cloth for cleaning or wiping. This may leave lint on the surfaces.
3. Fill the reservoir with gum solvent flushing oil.
4. Run the pump, not operating the controls, for one half hour. Then operate control valves, with no work going through the machine for at least an hour and a half. Two hours is better.
5. Drain the used flushing oil into suitable container properly marked for further use. Make sure draining is complete.

Refilling: Refill reservoir with the grade of hydraulic oil herein specified. Run machine ten minutes and check oil level.

Note: If the oil replaced in the system is of a type or grade other than herein specified, the filters should be cleaned and the above flushing and refilling repeated after 200 hours of service. *From The Houghton Line, a publication of E. F. Houghton and Co., Philadelphia, Pa.*

Trolley Wheel Lubrication

LUBRICATION problems often arise on trolley wheels for overhead conveyors that pass through heating and drying ovens. If the improper oil is used it will, due to the oven heat, melt and drip down on the units being carried on the conveyor.

Since all trolley wheels on overhead conveyors have fairly loose seals, they require the use of grease as a lubricant. Grease, being a mixture of oil and soap, is only as good for high temperature lubrication as the oil from which it is made. Generally, this limit is in the neighborhood of from 300 F to 320 F.

One exception is the new Silicone type of grease, particularly DC41, which gives long service at 350 F due to its low rate of evaporation and low rate of change in consistency. This grease can also be used up to about 450 F but for correspondingly shorter periods. One drawback to the use of this type of lubricant, of course, is its present high cost.

Our company has conducted extensive tests with standard commercial greases and oils for high temperature duty. It has been found that, among others, Socony Vacuum greases, Sovarex No. 1 and No. 2, and Keystone grease No. 48-medium and No. 62-medium, perform well up to temperature of 350 F. The first three greases listed are also water repellent and can be used for operations through washing machines and other wet zones. *From News-veyor, a publication of Mechanical Handling Systems, Inc., Detroit, Mich.*

Grip the Sides of

ANY V-Belt . . .

FEEL the Sides CHANGE SHAPE

as the belt Bends —

-That SHOWS you Exactly WHY

THE CONCAVE SIDE

(U. S. PATENT NO. 1813698)

SAVES You MONEY

Bend any V-Belt and you can actually feel its sides change shape.

That's because the bending puts the top of the belt under *tension*, while the body undergoes *compression*. Naturally the sides of the belt *bulge out*—and if the belt is built with *straight sides*, you get the result shown in Figures 1 and 1-A, below:—

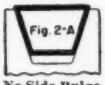
Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Clearly, the bending forces a straight-sided V-Belt into a shape that does not fit the sheave-groove—and the bulging produces excessive wear along the *middle* of the *sides*.

Now, bend the V-Belt built with the precisely engineered Concave Side (U. S. Patent No. 1813698)—the Gates Vulco Rope.

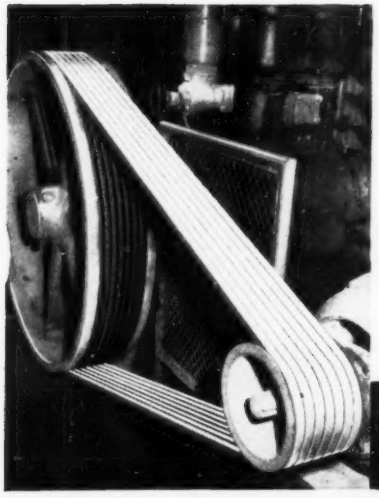
Gates Vulco Rope With Concave Side.



No Side Bulge. Precise Fit in Sheave-Groove.

You get the same shape change but *now* the new shape *exactly fits* the sheave-groove as shown in Figures 2 and 2-A.

Results—(1) *Uniform* side-wall wear; *longer* life. (2) *Full* sidewall grip on the pulley; carries heavier loads and sudden load increases without slippage — a big increase in drive efficiency — saving belt wear and also saving power!



The Concave Side is *MORE IMPORTANT NOW* Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side naturally delivers greater savings today than ever before.

THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

Gates

REG. U. S. PAT. OFF.

The Mark of SPECIALIZED Research

492

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. A. and 71 Foreign Countries

New Products and Methods

WHAT'S NEW? Here industrial ingenuity is summarized for your quick review. If you want additional information or have questions on specific applications use the addressed no-obligation, no-postage card between pages 18-19 and 58-59

1—Low-Cost Dust Filters

These complete, compact dust filters are said to offer many economies in limited capacity ranges for the purpose of collecting dust from grinding, screening, mixing, packaging, and finishing operations. Often several of these units are employed in preference to a single large collector, for greater flexibility of

operation, to save piping, and to keep different materials separate. They have the advantage of greater cloth area per cubic foot of air, hence greater filtering capacity.

These "Unit" Filters can be shipped assembled to facilitate installation. The W. W. Sly Mfg. Co.

2—Self-Propelled Hoists

Recently developed and perfected by this company, the adaption of fluid drive to high speed self-propelled hoists has been regarded as one of the outstanding improvements in modern motor-driven handling equipment. Entirely practical from the standpoint of economy and performance, the unit promises many advantages of benefit to all phases of industrial materials-handling. A double-action hydraulic coupling, connecting the motor and a simple gear train, provides a sustained flow of power to impart an unusual smoothness of operation to the hoist.

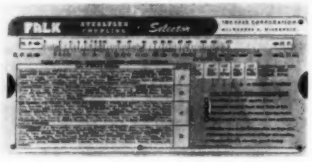
Employing only the basic fundamentals of hydraulics, the coupling eliminates jerks and jolts by absorbing shock loads and dampening out torsional vibrations. Transmitted entirely by the mass and velocity of the enclosed fluid, the full torque of the motor is evenly applied at all output speeds. Increased handling efficiency and prolonged wear-life of the equipment are the natural results. Other specific advantages include complete flexibility of acceleration and deceleration, closer control of heavy, bulky loads in limited space areas, and smoother braking. Cushioned starts and stops prevent unnecessary damage and abuse resulting from operator overcontrol and mechanical inefficiency. Considered a definite improvement over all other types of speed control, the fluid drive unit is equivalent to a variable-speed, slip-ring motor drive. However, complicated windings and troublesome slip rings, which are serious items in consideration of initial cost and maintenance expense, have been omitted from the design of motors used as the powering source. The nature of the application permits the utilization of general purpose motors, rated for the maximum running horsepower requirements of the hoisting operations. Robbins & Myers, Inc.

3—Coupling Selector

A new Coupling Selector was recently released. It was built for use by draftsmen, engineers, designers, plant engineers and other men who are instrumental in the selection and purchasing of flexible couplings.

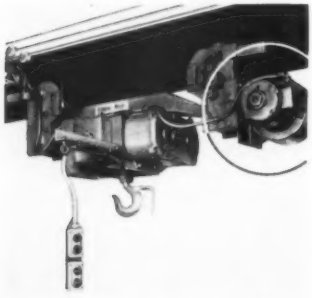
This new Coupling Selector will take care of the selection of couplings from sizes 3F up to size 18F. This handy new slide rule selection method makes it easy for a prospect to determine exactly which Steelflex coupling size is correct for his application.

The design of this selector is based upon the Falk Three-Dimensional



Method of selecting a coupling. That is . . . by horsepower . . . by application and by the rpm at which the coupling is to travel. This Three-Dimensional Method of selection rather than the customary bore size selection makes certain that the coupling is absolutely correct for the job involved. Correlation of these three factors is made easy through use of this selector. The Falk Corporation.

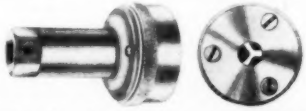
USE THE POST CARD



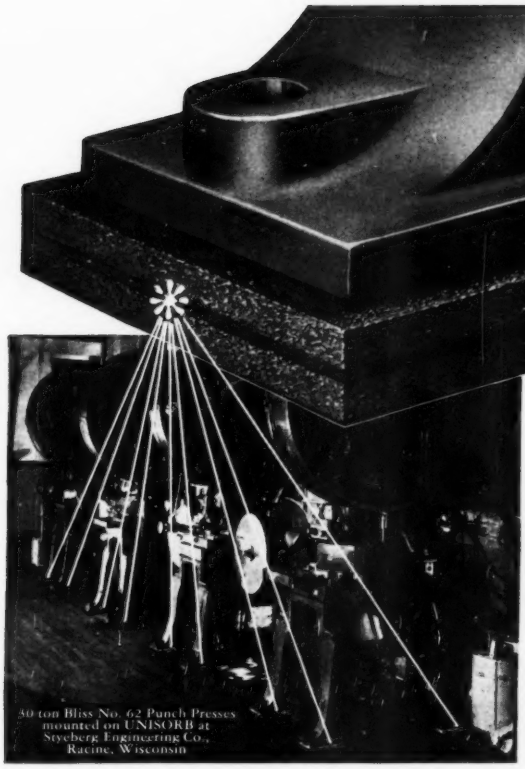
4—New Stud Puller

A new design stud puller with a capacity of ¼ in. to ½ in., is built in one unit, has no collets, wedges, or other parts needed to adjust it to different sizes of studs in its size range. That's part of the story behind this stud puller which operates most efficiently and effectively.

To operate, turn the knurled collar to "in" for replacing or "out" for removing, and slip over the stud. Then insert a ½ in. square drive handle and pull. The three jaws automatically close to stud size and grip when pressure is applied. The harder you pull, the harder they grip, but they never wedge; they "bite in" but never stick. Release the pressure and the jaws release, ready for another "bite." This feature gives the A-80 a built-in ratchet action for operation in close quarters. No ratchet wrench is necessary.



Because the grip is in the exact center, the tool turns on center. This means



50-ton Bliss No. 62 Punch Presses mounted on UNISORB at Styeberg Engineering Co., Racine, Wisconsin

NO FLOOR DAMAGE

...Because There's No DRILLING!

Eliminate Bolts and Lag Screws ... Mount Machinery on UNISORB

Easy to install, UNISORB-Mounting requires none of the maintenance care and expense you've been used to.

A special cement (we supply it) binds the UNISORB pads to machine feet and floor with a holding strength of 1500 lbs. per sq. foot *minimum.*

And it absorbs from 60% to 85% of transmitted noise and vibration . . . saves floors, building, machinery . . . often permits higher machine speed.

You'll want all the facts handy the next time you move a machine, or add a new machine — *or a new plant* — to your operation.

Write . . . *right now!*

LOOK FOR THE RED CENTER AND UNISORB BRAND MARK

THE FELTERS COMPANY

210-Z SOUTH STREET, BOSTON 11, MASSACHUSETTS

Offices: New York, Philadelphia, Chicago, Detroit
Sales Representatives: San Francisco, St. Louis
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.

THE FELTERS COMPANY
210-Z South Street
Boston 11, Mass.

Gentlemen:
Please send my free copy of "Why It Pays to Anchor Your Machines with UNISORB."

NAME..... TITLE.....

ADDRESS.....

COMPANY NAME.....

that the $2\frac{3}{8}$ in. face will turn in just that diameter. You can "pull" a ½ in. stud with less than 1 in. clearance between the stud and surrounding obstructions. It will operate equally well on long or short studs. Just ½ in. protrusion of the stud is necessary for proper operation, and no stud is too long. While the tool is only $3\frac{1}{2}$ in. high, longer studs can run out of the handle hole and the stud puller can then be turned with a Boxocket or open end wrench by means of the 1 in. hex milled on the top. Snap-On Tools Corp.

5—Ratio Test Set

A portable, direct-reading instrument for measuring turn ratio in power transformers has been developed. The set is designed for use on all types and sizes of power, distribution and auto transformers in common use, and reduces to a simple operation what heretofore has been a somewhat difficult task of measuring transformer ratio. Such measurements have frequently been a missing element during final inspection and at installation of transformers, and also are particularly helpful in analyzing transformer troubles and identifying tap connections. The

set also gives an immediate indication of polarity.

The Transformer Turn Ratio Test Set consists of a multi-ratio reference transformer which is excited—by means of a small hand generator—in parallel with the transformer under test. By means of four dial switches and a null balance indicator, the reference transformer is adjusted in ratio to equal that of the transformer under test. The ratio is then read directly from the dial switch indexes. Ratios up to 130 can be measured with an accuracy to within one part in 1000. The set operates without burden, at low-voltage excitation and by null balance, and therefore gives a precise measurement of no-load voltage ratio. It is supplied complete with testing leads and weighs about 31 lb. It is intended for use both in the shop and in the field. James G. Biddle Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 58-59

7—Magnetic Motor Starter

A new magnetic motor starter and magnetic contactor designed to give maximum protection to alternating current motors up to 50 hp, 440 v, has just been placed on the market.

Engineers at the company say the starter will provide longer contact life, greater protection and quiet operation. Actual factory tests, they say, show that the silver contacts on this starter give clean "make and break" for millions of operations.

Two outstanding features of the new starter and contactor are the relay heaters and the plastic-encased coil. The bi-metallic relay heaters will accurately follow the heating curve of the motor. The relay adjusts easily for automatic or manual reset when a simple lever is moved. The plastic-

6-Shielded Electrification for Tramrails

An outstanding development in tramrail electrification was announced nationally at the Materials Handling Exposition. According to the company, this design permits improvements in safety, simplicity in handling electrical problems, compactness in tramrail switches, savings in headroom and elimination of considerable wiring. As shown by the photographs, the shielded electrification is attached to the bottom of the tramrail by tack welding.

Electrical and physical characteristics as outlined by the manufacturer include: a design which fits most common industrial power characteristics; conductor bars which are symmetrical about the track center line; handles phase reversals by means of simple solution; insulation which is suitable for voltages up to 600 v.; negligible maintenance; protection from dirt in dusty locations and protection from ice and snow in outdoor installations; minimum arcing thus reducing fire hazards; chance of accidental or casual contact reduced; uniform copper-bearing steel of conductor bar resists corrosion and wear of bar does not affect surface analysis.

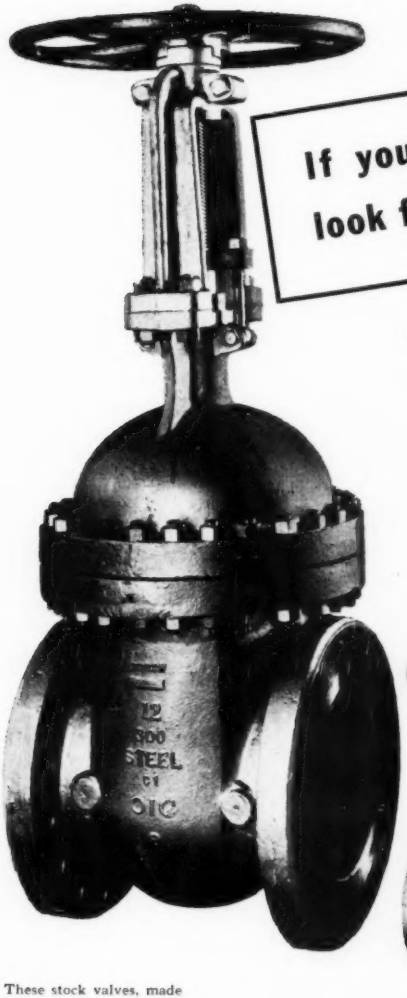
The shoe type collector is said to be unaffected by rocking of the tramrail trolley and thus the danger of single phasing of motors is minimized. Furthermore, the collector has a low effect on trolley drawbar pull and the size of the shoe is said to assure long life; when it does show sufficient wear to warrant replacement a new shoe can easily be inserted.

The features described in this item are integral parts of a complete tramrail system manufactured by The Forker Corp.

Fig. 1. Examining an installed current collector and holding another of the same type, President Forker explains operation and features to visitors

Fig. 2. Pencil points to shielded shoe collectors and conductor bars

If you're looking for extra service, look for MONEL in the valves you buy



These stock valves, made to serve in all types of pipe lines, are standard with seats of hard, corrosion-resistant cast "S"* MONEL, to insure longer service life with minimum maintenance. Made by Ohio Injector Company, Wadsworth, Ohio.

• • •

George Automatic Steam Drain Valves are designed for locomotive and steam plant service. The body of this valve is heat-treated "KR" MONEL, operating-spring is cold-drawn MONEL, and the conical closure disk is Type 303 18-8 Stainless Steel. Made by George Manufacturing Company, Phila., Pa.

How would you like valves in your plant that will always work perfectly... valves that will never wear out... valves that will never need maintenance attention? You'd probably describe them as ideal!

Valve manufacturers haven't succeeded in producing these ideal valves—*yet*. But many leading makers have taken a long step toward the ideal by making valve bodies and working parts of MONEL*. For MONEL is one metal that fights the three powerfully destructive enemies of all valves—erosion, corrosion, and abrasion.

MONEL valves and valve parts can give you improved performance in 4 important ways:

1. Fewer mechanical failures. MONEL's exceptional strength, which exceeds that of structural steel, can minimize failures caused by overstressing seats, stems, and other working parts.

2. Less erosion and abrasion wear. Because of its superior hardness, MONEL can substantially reduce damage caused by turbulence, flow erosion, and particle abrasion. With heat-treatable "K"* and "KR"* MONEL, a degree of hardness can be obtained that greatly exceeds that of other non-ferrous alloys. This feature, alone, can sometimes extend valve life by a large percentage.

3. Fewer corrosion worries. Being rust-proof and corrosion resistant, even at high temperatures, MONEL can greatly extend the service life of valves operated under severely corrosive conditions. With fewer replacements and repairs required, valve maintenance costs can be kept to a minimum.

4. Fewer failures caused by heat. MONEL has good heat-resistant qualities, and is satisfactory for service up to 800° F. MONEL is oxidation resistant, and does not embrittle even under continuous high-temperature conditions.

It is because of this remarkable combination of properties that MONEL has been chosen by so many leading valve makers as an industrial "task" metal. You'll find MONEL in many types of fine valves . . . valves designed to give you *extra* service with *minimum* maintenance.

If you would like more information about MONEL as a valve material, write to Bob Johnson, in care of the International Nickel Company. He will be glad to supply you with engineering data and dependable sources of supply. *Reg. U. S. Pat. Off.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

MONEL... *for minimum maintenance*

encased coil is intended to give greater life to the windings by protecting them from moisture, corrosion and abrasion. It has a permanent, self-lubricating

composition impregnated into the plastic that will keep the magnet guides sliding smoothly and at the same time eliminates annoying low voltage chatter. The Trumbull Electric Mfg. Co.

8—Industrial Water Cooler

The high capacity of a new industrial type water cooler has made it possible to apply a complete system without the use of space-consuming storage tanks.

Relatively small sized tanks only are required where water is used intermittently in very large quantities. Known under the trade name Temprite, this compact cooler measures only 14 in. in diameter by 54 in. high, the result of its ability to cool water instantaneously through rapid heat transfer. Design is based on the so-called "flooded" cooling principle which was originated by the manufacturer. Water coils are submerged in the liquid refrigerant itself and the heat of the water being used passes directly into the main body of the refrigerant.

In addition to water, the unit will cool alcohol, light oils, beverages, certain chemical solutions and other liquids. Besides general industrial applications, the Temprite is intended to be used for liquid cooling in bottling plants, bakeries, hospitals, hotels and institutions, certain air conditioning equipment and process cooling.

This high capacity cooler will deliver, for example, 1185 gal of 40 deg water per hour, assuming a 60 deg inlet temperature or 675 gal per hour of the same, assuming an 80 deg inlet temperature. Water is cooled only as required, eliminating unnecessary operation of the refrigeration machine. With the aid of an automatic control valve, water temperature is said to remain constant whether one gallon or full load is being imposed on the cooler.

Completely equipped with liquid refrigerant and control valves, the cooler operates with the refrigerant temperature only 4 deg lower than the desired exit water temperature, thus allowing the use of a high-suction pressure condensing unit. Temprite Products Corp.

9—Property Protector

The Chicago Watchclock System is said to reduce insurance rates by giving users extra property protection and a permanent record of their watchmen's attention to duty. The system consists of a portable watchclock, daily record dials, and fixed station boxes containing recording "keys." The newest model of watchclock—the Chicago Spartan A—eliminates the winding stem in the clock movement and uses a key instead. Hence, there is no projecting stem to bend or break should the clock be roughly handled.

The Chicago System is used by famous concerns all over the world. The system can be installed with no other tool than a screw driver, and soon pays for itself in reduced insurance rates. A folder now is available, explaining the system in general, and the Spartan Model A in particular. It is titled: "Who's Watching Your Watchman?" Chicago Watchclock Division.

10—Exhaust Snubber

Development of a new line of side inlet exhaust snubbers with "Fog-jet" has been announced. They are used on all 2- and 4-stroke cycle stationary gas engines (operating on either the Diesel or Otto cycle) requiring control of exhaust explosions during starting, as well as continuous suppression of sparks. Designated as Series SDL, these units are available in pipe sizes from 5 to 30 in., inclusive.

The SDL Series Snubber incorporates a Fog-jet which sprays a cooling water mist into the exhaust gases. Flame from the engine is also cooled and extinguished, while gas in the Snubber is made noninflammable by the mist.

Exhaust slugs entering the Snubber spin off a deflecting plate. The spinning action scrubs and breaks up carbon and other foreign material. The gas then spins into the second scrubbing section. Before the exhaust gas emerges, glowing sparks have been "scrubbed out," and the two snubbing sections, connected by a compact coaxial tube ar-

rangement, snub the slug of exhaust gas to prevent noise. Burgess-Manning Co.

11—For Maintenance Jobs

Many of those heavy machinery maintenance jobs in the industrial field can now easily be handled with a new model of the electric impact tool.

With standard accessories, the new model is rated to run and remove nuts up to $\frac{5}{8}$ in. thread size; drive and remove studs; extract broken cap screws and studs; apply and remove machine

screws of all kinds; run wire brushes; drill brick, metal, and masonry; tap; and ream. It may also be used for woodboring.

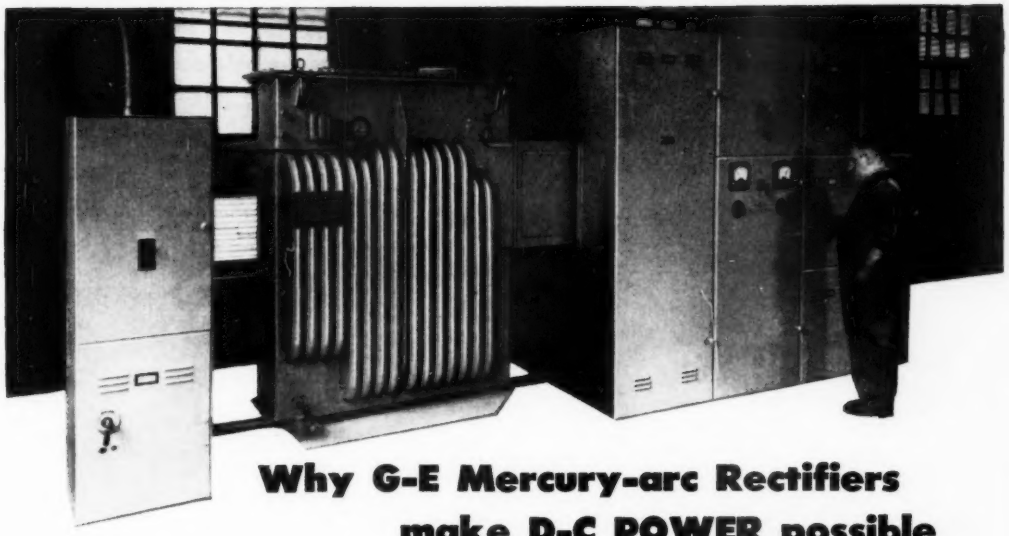
Known as the 8U, the tool may be used for such heavy jobs as removing covers from machines, tightening or loosening nuts on large pipe collars and elsewhere, and for general all-purpose maintenance work around machine shops.

It has all the features and advantages that have made the 4U model so useful for light maintenance and production work. The reversible motor makes it as easy to remove screws, studs, and nuts as to apply them; the motor never burns out—even if the spindle stalls; the impact principle operates whenever resistance is met and provides extra power to push through the job. Virtually no torque reaction is transmitted back to the operator. Ingersoll-Rand Co.

12—Combination Meter

A new single-phase combination watthour and thermal watt demand

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 58-59

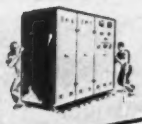


Why G-E Mercury-arc Rectifiers make D-C POWER possible at LOW COST!

More and more small and medium-sized industrial plants are turning to G-E Mercury-arc Rectifiers for their d-c power. Why? Because they can be installed quickly and easily! Because they provide high over-all efficiency at full or partial load! Because they make d-c power possible with many money-saving features!

This 150-kv mercury-arc rectifier, located in the maintenance department of a short line railroad in Ohio, is typical of the units used for small and medium-size industrial plants. It converts a-c to d-c for machine tools and crane motors. What pleases this user is "a 91% operating efficiency at full load, clean and quiet operation, and a considerable cut in maintenance costs."

Find out how you can put d-c power in your plant at a saving. Call or write your nearest G-E sales office for information on a size to fit your requirements. Apparatus Dept., Section 800-46, General Electric Company, Schenectady, New York.



Low Cost Installation . . . because G-E Mercury-arc Rectifiers have no major rotating parts, they can be installed quickly and easily any place that is reasonably level and capable of supporting their weight.

Low Cost Operation . . . because G-E Mercury-arc Rectifiers give you high efficiency over a wide load range, with low no-load losses, and at low cost maintenance, their operating costs are naturally low.

Low Cost Maintenance . . . because G-E Mercury-arc Rectifiers only require periodic inspection of the equipment, and because they can handle momentary overloads without increasing maintenance, the cost of upkeep is kept at a bare minimum.

G-E MERCURY-ARC RECTIFIERS MEAN LOW-COST D-C POWER

GENERAL ELECTRIC

New Products and Methods

meter for industrial use has been announced.

Designated as the Type IHM-1, the new meter is housed in a case slightly larger than that required by a conventional watthour meter. It can be installed wherever rate structures require the determination of demand as well as energy, without increasing the size of the original installation.

The revolutionary new damping system and electromagnet of the recently introduced I-50 watthour meter, adapted to the new design, comprise the watthour unit of the Type IHM-1 meter. The thermal unit of the Type HI-1 thermal meter with its "direct heat" operating principle has been adapted for use as the thermal demand unit of the new combination watthour and thermal watt demand meter. General Electric Co.

13—Coal-Fired Heater

The shortage of various types of fuel in different parts of the country had led to the development of a coal-fired warm air space heater that can be easily converted for firing with gas or oil. The new unit is described as the answer to the problems that confront the managers of factories, foundries, garages, warehouses and other industrial and commercial establishments when certain fuels are available in limited amounts during the winter. It supplements the company's present line of "Counterflo" Heaters that are fired either by oil or gas.

One of the chief features of the unit, besides its fuel convertibility, is the use of a stainless steel combustion chamber. It is one of the first coal-fired heaters made with a stainless steel combustion chamber. Use of this metal increases service life and eliminates a substantial amount of the customary side wall refractory.

The new model is available in two output capacities, 1,250,000 Btu per hour and 1,500,000 Btu per hour. Fuel consumption for output of 1,250,000 Btu per hour is estimated at approximately 133 lb per hr, based on coal having a calorific value of 12,500 Btu per lb. Dravo Corp.

14—Rubber Expansion Joints

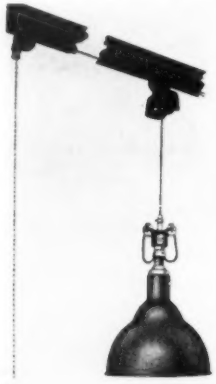
These new rubber expansion joints are recommended by the manufacturer for installation in such places as piping in general, vacuum and water lines to

and from condensers, pump suction and discharge lines, ventilating systems and others. They are made of a high grade rubber compound combined with plies of sturdy cotton duck and the whole reinforced with steel wire or rings. Flexibility is provided by a central arch in the body.

Made in three styles, for pressure, for vacuum and for both, these joints are suitable for handling hot or cold water, brine or exhaust steam at temperatures not to exceed 180 F. Advantages listed by the manufacturer include: long-lasting because the rubber does not crack under repeated flexing; does not take a permanent set; does not corrode or erode; light in weight and can be installed in a limited space; require no gaskets; do not induce electrolysis. Garlock Packing Co.

15—Lowering Hanger

A disconnecting and lowering hanger for use with all types of high-level lighting fixtures located sixteen (16) or more feet above floor level has been announced. This new hanger facilitates rapid, safe maintenance of inaccessible lights and provides maximum economy by greatly reducing cleaning costs.



A remotely-controlled, latching type, overhead, disconnecting switch combined with a fixture lowering and raising device, the Model L-141 Hanger

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 18-19 and 58-59

permits lowering of lights for cleaning, lamp replacement, or repair. A complete hanger installation consists of upper and lower assembly units, length of chain or cable for lowering and raising lighting fixture, positive locking device, and a pulley. Fixed upper assembly unit, secured to supporting structure, carries a pair of cup type contacts to which power feed lines are attached. Lower asesmbly unit, which supports fixture, is fitted with two engaging contacts which complete the circuit when assembly is in raised position.

Thompson hangers eliminate need for ladders, scaffolds, and dangerous climbing. The lighting fixture, when lowered, is "dead," and maintenance worker can either repair, service, or clean it with absolute safety from electrical hazards. The Thompson Electric Co.

16—Plastic Aprons, Sleeves

Chemgard translucent plastic aprons and sleeves for protection against chemicals, greases, dirt, and solvents in the processing industries, industrial plants, mills, and shops have been announced.

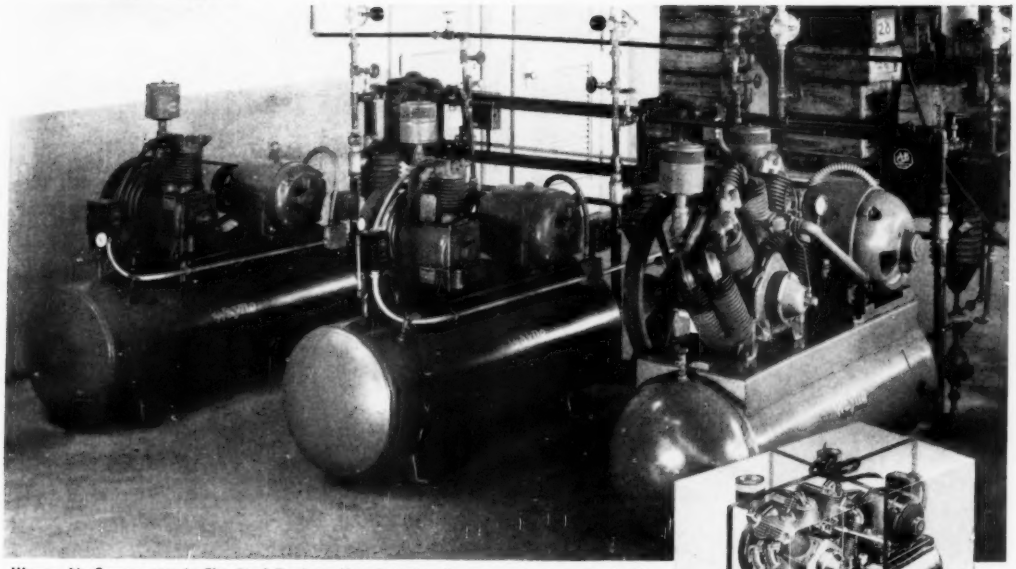
Strong, long-wearing, light in weight, M.S.A. Chemgard Aprons and Sleeves are non-porous, non-absorptive, will not crack or deteriorate at normal working temperatures. Seams are electronically welded and plastic neck and waist straps are permanently sealed to the garment at one end, fitted with adjustable snap fasteners at the other. Chemgard Aprons and Sleeves are stainproof, odorless, easy to keep clean. Mine Safety Appliances Co.

17—Localize Oil, Coolant

In small drill presses, milling machines, saws, punch presses, filing machines, and a host of other machines, which are serving dual purpose of dry or wet operations, the use of liquids or air becomes a problem of set-up expense by the set-up man and maintenance departments loss of time, in finding the proper brackets, wire, etc.,

(Continued on page 57)

"NEVER WITHOUT AIR"



Wayne Air Compressors in The Steel Products Manufacturing Company plant, St. Louis, Mo.

Decentralize

AIR SUPPLY FOR SAFETY

INSURE continued production without danger of interruption due to lack of air by departmentalizing air supply in your plant. Install a Wayne in each department using air. These units will pay for themselves quickly, by eliminating wasteful operation of the large central compressor when only one or two departments work overtime.

No time is lost waiting because another department is using air. If air requirements are different in different departments, each Wayne unit can be set to provide the pressure needed. There are many other money saving advantages which a Wayne representative will gladly explain to you. Investigate Wayne Industrial Air Compressors now.

WAYNE NATIONWIDE SERVICE

Investigate

THE WAYNE AUXILIARY UNIT PLAN!

THE WAYNE PUMP COMPANY • FORT WAYNE 4, INDIANA
520 Tecumseh Street

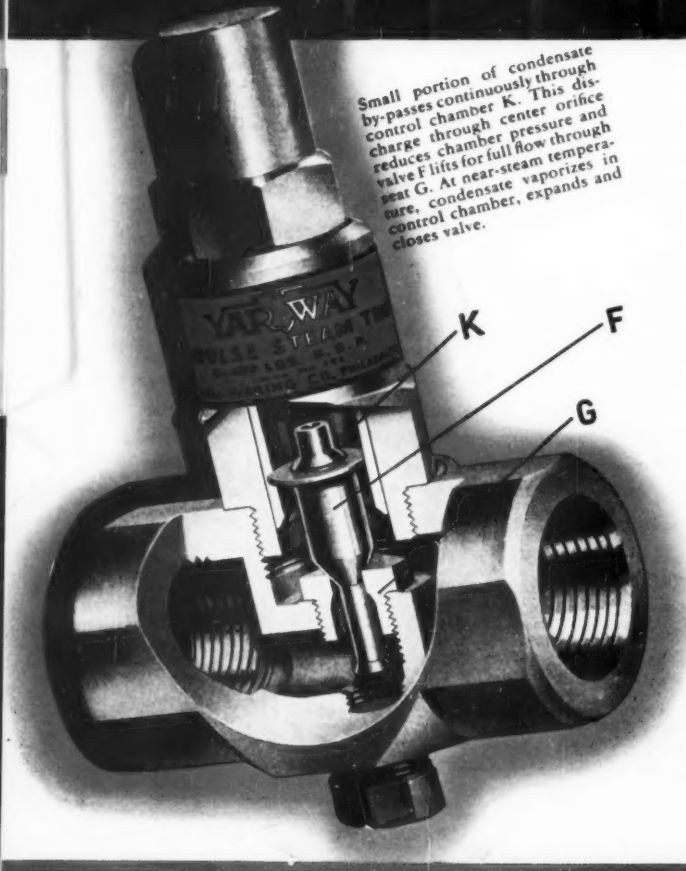
Please tell us more about Wayne Air Compressors and send booklet, "The Wayne Auxiliary Unit Plan." No obligation.

NAME _____ ADDRESS _____

CITY _____ STATE _____

HOISTS • LOADING DOCK LIFTS • HOSE REELS • POWER WASHERS

Six and How They Work!



Small portion of condensate by-passes continuously through control chamber K. This discharge through center orifice reduces chamber pressure and valve F lifts for full flow through seat G. At near-steam temperature, condensate vaporizes in control chamber, expands and closes valve.

Six Yarway Impulse Steam Traps—doing a big job draining condensate from a battery of autoclaves used for experimental extraction of tanning materials. They are typical of the two hundred Yarway Traps installed on a variety of steam equipment at the big Eastern Regional Research Laboratory of the United States Department of Agriculture.

Why were Yarways selected for this important work? For the same reason that over **600,000** Yarways have been bought in less than **12** years for use throughout all industry. *They get steam equipment hotter, sooner . . . and keep it hot.*

In addition, maintenance is easy. There is only one moving part, a simple valve. Small size speeds installation . . . no extra supports are needed. Yarways are good for all pressures without change of valve or seat. And finally, it often costs no more to install Yarway Impulse Traps than to repair older types.

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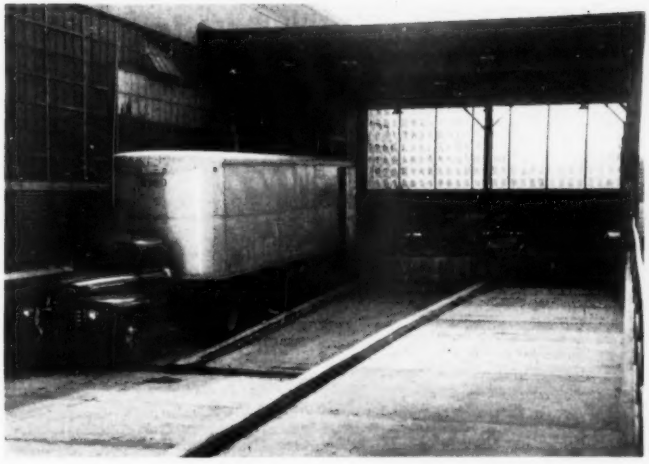


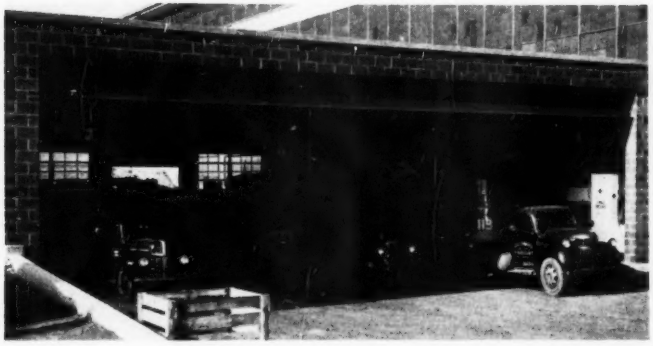


Fig. 1. Above: Building No. 3 at Ford's Mound Road Plant features a radical departure in dock structure, three levels for various types of special equipped trailers. The lowest level has an elevating platform for use under the rear wheels of low bed trucks and trailers. This answers the same purpose as the pivoted platform in Fig. 3, but has the advantage of a level approach

Fig. 2. Left: The Ford Plastics Building dock, covered, has a capacity for four trucks. An overhead crane is provided for unloading open top equipment

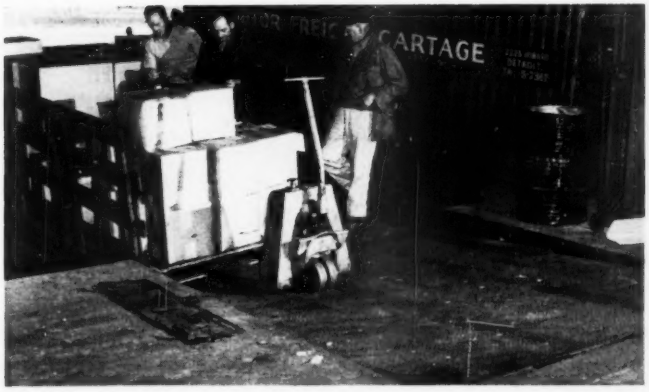


Fig. 3. Right: Ford's Parts & Accessories Building dock has capacity for 12 vehicles, all of which have hydraulic platforms to conform to the height of the truck floor. This photo shows one of the platforms depressed for a low truck. They may be raised an equal amount for a high truck

CONVEYORS and CONTROLS for Mechanized Foundries

Benefits and costs in production of gray iron castings for appliances, refrigerators and Coca Cola dispensers . . . Under-the-floor shake-outs and conveyor belts separate castings and molding sand, return sand to bin . . . Sand system conditions sand, carries it to individual hoppers above molding machines . . . Interlocking control system protects equipment . . . Tramrail conveyor carries hot castings around outside of building to cool them, deliver them to sorting operation

By **THOMAS E. HANSON**, Managing Editor, Plant Engineering

MECHANIZATION of the foundry at Westinghouse Electric Corporation's East Springfield, Mass., plant is paying off in rehabilitation of older workers and increases in production. While production schedules were not the prime factor in the decision to spend the $1,250,000 which the program cost, it is a fact that capacity has been upped from 60,000 lb to 100,000 lb daily melt with possibilities of further increases with the addition of another shift. The need to improve working conditions in order to attract the right kind of worker was the determining factor in approving the program.

A typical example of the reduction in the amount of necessary lifting is shown by the 1/6 hp refrigerator motor housings molding operation. The load that had to be lifted was reduced from a total of 1322 lb per mold of four housings for the previous manual operation to a total of zero for the new mechanized arrangement. Under the old way of doing things the weight lifting indulged in by the employee would have done credit to any member of the grunt and heave profession. The operation included: 65 lb for handling of the flasks; 292 lb for shoveling sand; 357 lb for conveying the molds; 88 lb for shifting pouring weights; and 520 lb for shaking out, conditioning sand, etc. The mechanized installation has completely eliminated these five back-breaking chores and when this is done 500 times per day the benefit to the employee is tremendous—a total of 661,000 lb which he didn't have to lift.

The most interesting feature of the foundry for the average PLANT ENGINEERING reader is the remarka-

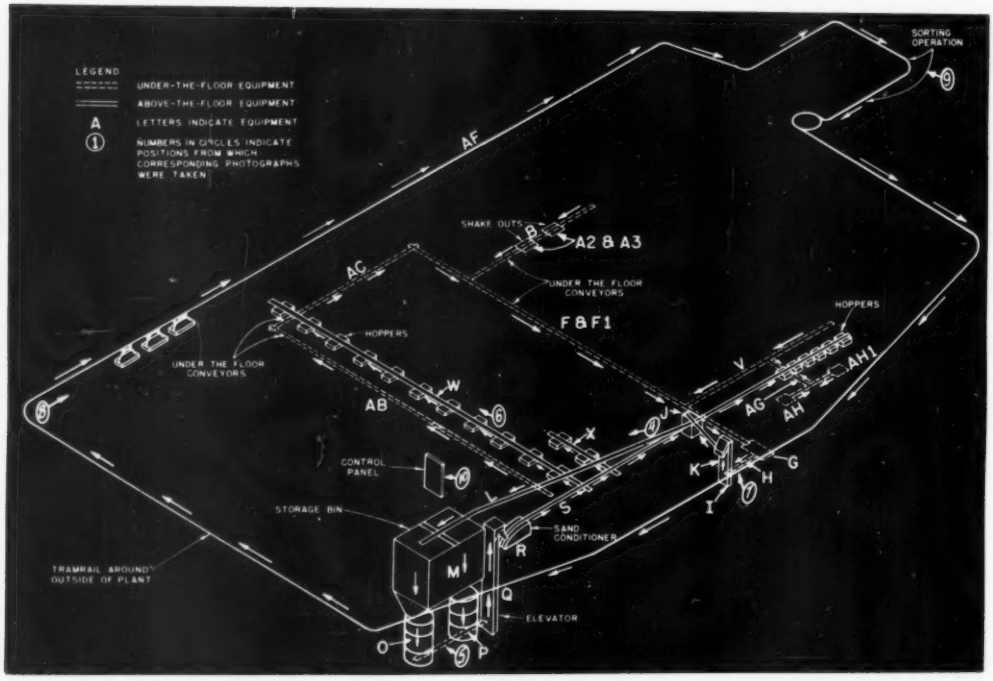


Fig. 1. Schematic diagram showing shake out system and sand handling system. Tramrail system shown at perimeter carries hot castings around outside of building to sorting operation

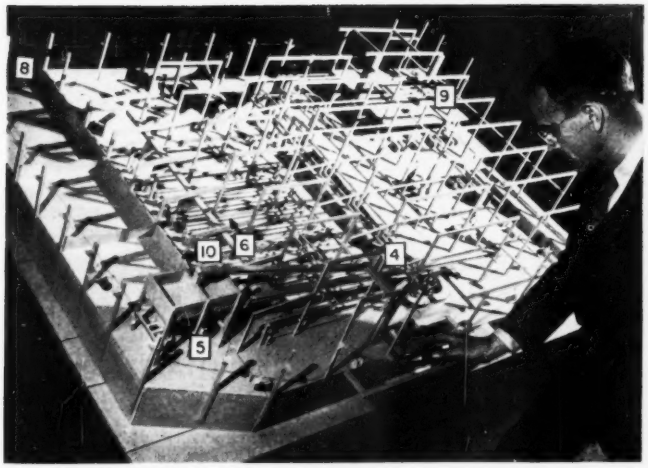


Fig. 3. Scale model of the mechanized foundry. Circled numbers and arrows indicate positions and directions from which other photographs were taken

ble system of conveyors and their controls. The conveyor system may logically be divided into two separate groups, the shake-out system and the sand system.

The function of the shake-out system, identified in Fig. 1 by Units AB through L, is to load the trolley conveyor with castings and scrap and return the molding sand to the sand system. Each molding machine is set on subway grating over the spill sand conveyor. Each of the shake outs discharges the contents of the flask—hot sand and castings—onto an oscillating under-the-floor conveyor that carries them to the perforated vibrating shake-out. The under-the-floor system consists of three belt conveyors totaling 220 ft in length, and six Hydraflow conveyors totaling 196 ft in length. The system of tunnels under the foundry, through which the conveyors travel, add up to a total of 430 ft in length.

After passing through the perforated shake out, the sand runs over a magnet pulley, H, Fig. 1, that extracts tramp iron. An elevator, I,

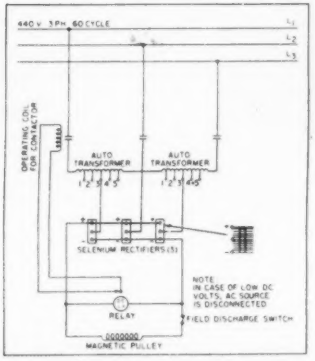


Fig. 2. D-c power for the magnetic pulley at H, Fig. 1, is supplied by a selenium rectifier connected to the 440 v circuit as shown here

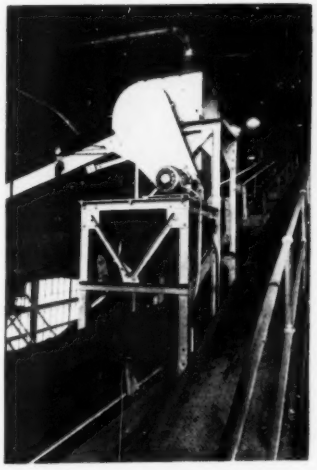


Fig. 4. Inclined belt conveyor, L, at center delivers sand to storage bin. Horizontal belt, S, carries conditioned sand to individual hoppers

then carries the sand to a vibrating screen, K, where cores and lumps are removed. From here it is moved to the 250 t hot sand storage bin, M, via a rubber belt conveyor, L. Two mixers, O, each driven by a 40 hp motor, are directly below the storage bin. It is here that the used sand in the bin is mixed with new sand, clay and water in measured amounts. The mixed sand is then discharged through bottom openings in the mixers to a rubber belt conveyor, P. The belt conveyor carries the sand to an elevator, Q, that discharges it into a sand conditioner, R. From the conditioner, the sand is transported by a series of rubber belt conveyors, S, W and X, to the hoppers above the various molding stations, Fig. 6.

There are 33 motors ranging in size from ½ hp to 50 hp, a total of 345 hp, required to drive the sand handling, shake-out and sand preparation and ventilation systems. Control of most of these various motors is segregated into shake out and sand handling systems. The shake out system includes untis L, J, K,-I, H, G, F, F1, V, AG, AH, AH1, B, A2, A3, AC and AB. The description, function and horsepower rating

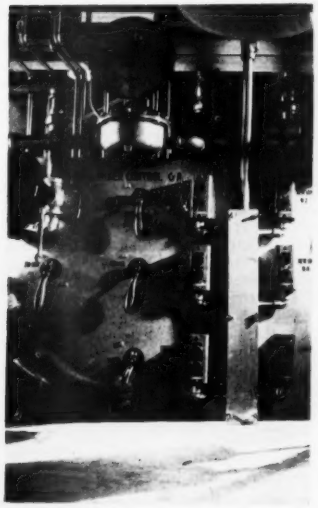


Fig. 5. View of sandmixer control panel

of these units is indicated in Table I. For safety, the shake out and sand handling systems are interlocked so that all equipment beyond the stopping point continues to run but all equipment in back of the point of stoppage will be shut off. The flow of material originates in the shake out system from AB and continues to L; the interlocking sequence is from L to AB. That is, if AC should be stopped AB will also stop but the remainder of the shake out system will continue to operate.

The sand handling system includes units W, X, S, R, Q, U and O, and is also interlocked so that all equipment beyond the stopping point continues to run while all equipment in back of the point of stoppage is halted. The flow of material is from O to W, the interlocking sequence is from W to O in the order

Fig. 6. Operator fills individual hoppers on at one station on molding machines

listed above, as shown in Fig. 1 and as listed in Table I.

Units A2 and A3 are tied in with unit B. Either may be run independently of the other but unit B must be operating before units A2 or A3 can be started. Unit V is started independently of unit B but it ties in with unit F1. F1 must be running before unit V can be started. Units AG, AH and AH1 are tied in with unit V.

Another feature also indicated on the drawing, Fig. 1, is the 600 ft long trolley conveyor that is driven by a 7½ hp motor. This conveyor carries hot castings from the perforated vibrating shake-out around the outside of the building, Fig. 8, to an area adjacent to the cupola charging operation. Here, as shown in Fig. 9, the castings are sorted, gates and sprues removed. The conveyor travels about 10 fpm and rises to a height of 22 ft above the ground. The 2 ft by 4 ft trays on which the castings are carried are loaded automatically and are spaced as close together as practicable. The conveyor serves a three-fold purpose: one, to give the hot castings time to cool down; two, to keep the heat of the castings outside the building; three, to carry the castings to the sorting operation described above.

All motors for the sand handling and preparation system are operated on 440 v, 3 phase, 60 cycle a-c power which is supplied from a bank of three transformers, connected delta-delta, totaling 1000 kva. Primary voltage is 13,800 and secondary voltage 440. From an 800 amp circuit breaker connected to the low voltage bus, two 3-phase circuits of 500,000 cir mil cable are run to a sequence control panel Fig. 9, from which all motors are operated. Single phase power at 110 v is supplied from transformers connected to the 440 v circuit. D-c power for the magnetic pulley, used to extract tramp iron from the molding sand at H, is supplied with a selenium rectifier connected to the 440 v circuit as shown in Fig. 2.

HEATING, VENTILATING THE FOUNDRY

An important adjunct to good working conditions in the Westinghouse Springfield Foundry is supplied by the excellent system of heating, ventilating and dust collecting. According to information compiled by Westinghouse, prior to the installation of the new shake-out system when the molds were dumped by hand, the dust counts varied between 3 and 35 million particles per cu ft with an average value of about 20 million. Since the installation of the new equipment, which consists in part, of three American Air Filter Roto-Clone wet dust collectors, the count in these areas has been reduced to about 1.7 million particles per cu ft.

The wet dust collectors, totaling 60,000 cfm are driven by two 40 and one 50 hp motor and they draw air

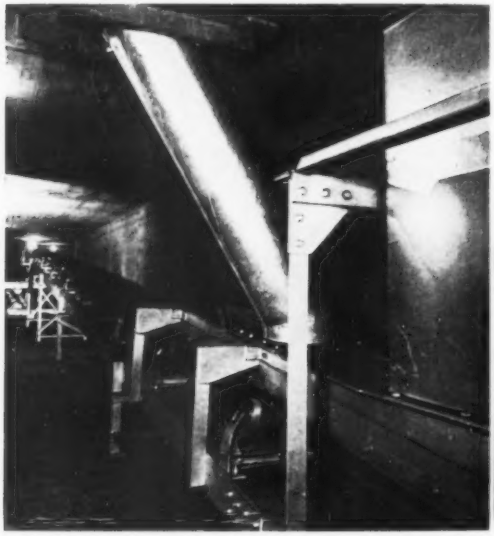


Fig. 7. Belt conveyor AC carrying spill sand from spill belt AB to Oscillators F and F1

Fig. 8. View of tramrail conveyor located outside of building to cool castings and cut down heat rise inside building

Table I. Equipment involved and material flow in shake out and sand handling

Unit	Equipment Description, Function and Horsepower of Drive
AB	120 ft Horizontal Spill Belt Conveyor—3 hp motor. Receives spill sand from molding machines for delivery to spill belt conveyor AC.
AC	58 ft Horizontal Spill Belt Conveyor—5 hp motor. Receives sand from AB for delivery to oscillating conveyors F and F1.
A2 and A3	3 ft x 6 ft Shake-out Screens—5 hp total. Receives sand and castings from housing line for delivery to oscillating conveyor B.
B	49 ft Unbalance Oscillating Trough Conveyor—5 hp motor. Receives sand and castings from A3 and A2 for delivery to oscillating conveyor F and F1.
AH and AH1	7 ft Unbalanced Oscillating Trough Conveyors—7 hp motor total. Receives spill sand from molding machines for delivery to oscillating conveyor AG.
AG	15 ft Unbalanced Oscillating Trough Conveyor—3½ hp motor. Receives spill sand from AH and AH1 for delivery to spill conveyor V.
V	36 ft Horizontal Spill Belt Conveyor—2 hp motor. Receives spill sand from AG for delivery to oscillating conveyor F and F1.
F1 and F2	133 ft Unbalanced Oscillating Trough Conveyor—10 hp motor total. Receives sand and castings from AC, B, and V for delivery to shake-out screen G.
G	4 ft x 8 ft Shake-out Screen—7½ hp motor. Receives sand and castings from F and F1. Sand drops down to magnetic conveyor belt H. Castings slide into loading chute for conveyor AF.
H	8 ft Inclined Magnetic Belt Conveyor—3 hp motor. Receives sand from G for delivery to bucket elevator I.
I	48 ft Vertical Elevator—7½ hp motor. Receives sand from H for delivery to vibrating screen K.
J	21 ft Inclined Belt Conveyor—3 hp motor. Receives sand from K for delivery to belt conveyor L.
K	4 ft x 10 ft CA-148 Vibrating Screen—3 hp motor. Receives sand from I for delivery to belt conveyor J.
L	40 ft Inclined Belt Conveyor—5 hp motor. Receives sand from J for delivery to sand storage bin M.
M	200-t Storage Bin above Simpson Mixers. Receives sand from L for delivery through measuring hoppers to mixer 10.
N	4 New Sand Feeder Conveyors for Simpson Mixers—6 hp total. Receives sand from M for delivery to Simpson Mixers O.
O	Two No. 3 Simpson Mixers—80 hp total. Receives sand from N for delivery to belt conveyor P.
P	24 ft Horizontal Belt Conveyor—5 hp motor. Receives sand from O for delivery to vertical elevator Q.
Q	32 ft Vertical Elevator—7½ hp motor. Receives sand from P for delivery to sand conditioner R.
R	Sand Conditioner—5 hp motor. Receives sand from Q for delivery to belt conveyor S.
S	132 ft Inclined and Horizontal Belt Conveyor—3 ft motor. Receives sand from R for delivery to sand hoppers T and U and belt conveyors W and AI.
T	Molding Sand Hoppers. Receives sand from S for delivery to molding machines below.
W	165 ft Horizontal Belt Conveyor—5 hp motor. Receives sand from S for distribution to 11 molding sand hoppers.
X	24 ft Horizontal Belt Conveyor. Receives sand from S for distribution to 2 molding sand hoppers.

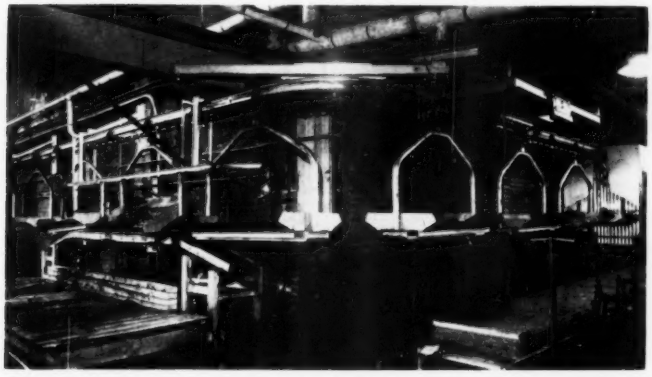


Fig. 9. End of tramrail conveyor trip where gates and sprues are removed for cupola charging operation, right, and where castings are sorted, left

Fig. 10. Sequence control panel. From this point all sand system and shake-out system motors are controlled. Note sequence diagram at top of panel

from such dust producing areas as the shake outs, mixers, vibrating screens, etc. The major part of the dust collected in these wet dust collectors is carried away with the waste water into the sewer. The heavy dust that is not carried away is collected in a settling tank in sludge form. The sludge thus collected amounts to ¼ cu yd or 1350 lb daily.

Three bag type, dry dust collectors are installed on other pieces of dust-producing equipment. Two of these are Amercian Foundry Equipment Co. units and the third is a Pangborn unit; they draw air from such pieces of equipment as tumblers, grinders, sand blasters and Wheelabrators. They extract approximately 1 cu yd or 2430 lb of dust daily.

Heating of the foundry is accomplished by forced air unit heaters installed at strategic points so they can draw in fresh air from the outside or recirculate air within the building. There are 16 of these heaters with a total output capacity of 7,800,000 Btu based on 5 lb steam at 60 deg entering air. Ten forced air curtain heaters over outside doorways and at entrances and exits of the trolley conveyor have a total capacity of 4,500,000 Btu and help maintain an inside temperature of 60 F with an outside temperature of 0 F and 15 mph wind.

In addition to the air cleaners and unit heaters there are eighteen fan-driven roof ventilators totaling 113,000 cfm. Two of the three American Air Filter Co. Roto-Clone units, are mounted one above the other to conserve floor space.

HEAVY RIGGING in the Plant

Proper sling angles . . . Importance of rope and sling inspection . . . Protection of fragile, exposed parts . . . Beware sharp, rough edges on crane hooks . . . Special hitches for multiple crane lifts . . . Using chain hoists in combination with cranes . . . Other special hitches

By H. B. McDERMID*

ALL TYPES of rigging, whether chain, hemp or wire rope, should be used on a crane hook as nearly vertical as possible in order to get maximum safety. A heavy strain is imposed on the rope or chain if wide angles are permitted. The drawing, Fig. 1, published by American Mfg. Co., illustrates the point graphically. If one is inclined to doubt this phenomenon, a small experiment is a good convincer. Suppose we take a piece of light rope 100 ft long, with one end tied solidly to a firm support. Stretch the rope out horizontally and fasten a small weight at the mid point. Now, take hold of the free end and see how much pull is required to raise the rope to a nearly level position. If we had a powerful crane, instead of the 5 lb weight, pulling at the center of the rope it is easy to imagine the terrific strains that would be set up.

*Part I, Heavy Rigging in the Plant, appeared on page 24, August, 1948, PLANT ENGINEERING.

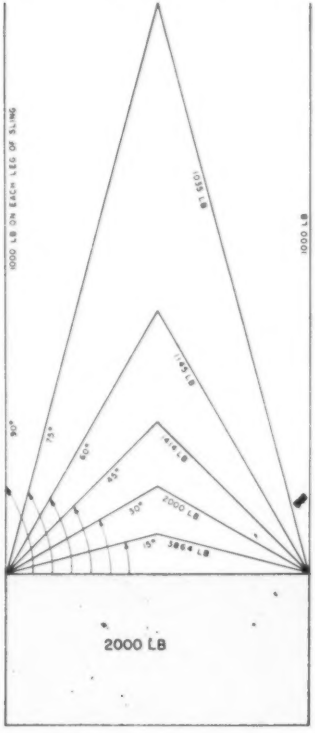


Fig. 1. Allow for sling angles. The tensile strength of a rope is based on direct pull. Angles created by using a rope sling greatly increase the load factor as the angle changes from vertical to horizontal

Both hemp and wire rope usually give fair warning of impending failure in case of overload. Overload is sometimes hard to avoid if weights of objects being handled are unknown or if expert knowledge of rope strengths is not available, either from practical experience or from load lists published by manufacturers. In such an event the strains must be estimated and the rope must be inspected carefully as the job progresses. Always play safe in making an estimate of this kind as failure of the apparatus can be ghastly in its consequences.

Always allow a margin of extra strength for the unforeseen that is always coming up. Failure to do so may be costly. On one job a large and fairly heavy bulkhead had to be placed in concrete slots across a deep waterway to shut out floods. The engineer in charge had specified a very light cable for the hitch because it had figured out all right with a factor of safety of 5. But the bulkhead caught and bound in the slots and because the hoisting motor could not be instantly shut off, the cable parted, and down went the load into deep water. The expense involved in retrieving it ate up several times the amount saved.

Many times it happens that the preferred rigging is not available, and one must use that which can be obtained. Perhaps a hemp rope sling is wanted but only a piece of rope of reasonable size is available with no time to make up a sling. The two ends can be tied together —but avoid the square knot for this purpose. You may get by if you are born lucky but if one of those loose ends gets jerked by accident or by some greenhorn grabbing it to stop the "swing of the load" it will roll into two half hitches around the other end of the line. The load will then drop almost as fast as if it were falling free. If it draws up safely it is likely to tighten up so badly that it cannot be opened at commercial speed.

Oftentimes when raising a load it

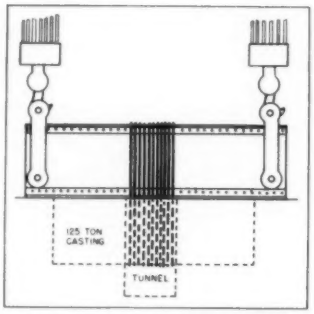


Fig. 2. This is the method the author describes for a two-crane hitch on heavy castings. Estimated total lift in this example is 200 t

will be found that there are fragile parts on it that will be crushed by the tightening of the ropes, unless they are protected. The rigger must be alert for this possibility on every hitch applied. Spreaders between the parts of the hitch must then be placed to prevent damage to the load, and care must be taken that strong enough braces are used. The pressure is apt to be greater than realized and they may be crushed. It is not unusual when 2-in. lumber, often used for such spreaders, is crushed if it is not reinforced.

Some times a rigger will "lace" the crane hook to his load with many parts of wire rope with the ends finally fastened together with cable clamps. This *can* be good practice in the absence of specially designed hitches but it must be done with care, especially with heavy loads. One such instance nearly ended disastrously. A 120 t, 28 ft diameter rotor for a vertical shaft hydro-electric unit had to be assembled. It was the first of fifteen such units and no special rig for attaching it to the crane hook had yet been received on the job. The crane had just been erected and no heavy lifts had been made with it.

Boss Rigger, being a man who "knew his stuff" took plenty of pains having the new hook carefully filed to be sure no fins or rough spots were present. Then he laced plenty of new $\frac{5}{8}$ in. cable around the crane hook and the hook bolted to the top of the rotor shaft. When the rotor was lifted, the 5 ft diameter flange coupling on which the rotor had

been standing had to be surface cleaned and checked while hanging on the crane. All the men who could work, crowded under it to get the work done with as little lost time as possible. Then the assembly was set down in its final position and the cables taken off. One part was found to be cut all the way through except for one strand, and that was badly damaged! All that had held the hitch in place was the grip of the other cable parts upon the damaged one, sidewise!

In the sketch, Fig. 2, is shown another hitch which allows two cranes to be attached to a load too heavy for one crane. Here a large engine bed has been poured in the foundry, a tunnel has been dug under it and a 4 ft steel bridge beam has been lashed to the casting. The two cranes can then approach close enough together to allow them to get hold of each end of the beam. In this case the casting weighed 125 t, the sand cores about 25 t (the grip of the hard baked dry sand mold is anybody's guess). The cranes were rated at 60 t each, but must have been very generously underrated.

They pulled that load out with no sign of distress, got it up to the scratch room, several hundred feet away. They kept on doing it till they had taken sixty such loads up there during the author's visit, besides doing their regular daily work.

Special rigs like this are often used especially where the work lends itself to their use or is of a sufficiently repetitive nature to make the hitch worth while.

Modern crane controls can regulate cranes much more closely than was possible with many of the older types. There are still a good many of the older controls in existence and the following method of spotting parts will often prove of help. On one job which I witnessed there were 100 or more pieces weighing 1200 lb each which had to be spotted quite accurately for the insertion of tap bolts.

The crew doing the job were using a 150 t crane's auxiliary hook which was speeded much too fast and it was only by the grace of providence or sheer luck that the pieces were ever spotted correctly. An old time rigger noticed the fix the "lads" were in. He promptly got a 1 t chain hoist, hung it on the crane hook, attached the piece to be spotted to the hoist hook, had the crane operator spot the piece roughly and he would then smoothly slide the piece into place with the chain hoist.

An adapter for a double hook or tee hook for a crane is shown in Fig. 3. Often it is desirable to be able to change very quickly from the tee hook to the single hook and vice versa. This simple assembly of triangular plates and three pins enables it to be done without delay, and centers the strain exactly.

There are numerous special rigs and hitches, each made for a specific purpose. The steel mill's "skull cracker" rig is one made to pick up a large pear-shaped weight and, after raising it to its limit, dropping it free some 50 ft upon the skulls or frozen shells of steel which collect on the linings of the ladles and which must be broken up for remelting. Another is the crane serving the steel mill's soaking pits where the steel ingots are heated slowly in preparation for rolling.

When the ingot is to be handled this crane gets on the job, with a huge pair of power-operated tongs. Reaching down into the soaking pit it clamps down on the ingot, pulls it out and carries it off to the rolls. Another steel mill crane has a set of special hooks set side by side on a bar, much after the manner of the fork truck, except that the whole rig is handled by the hook of the standard overhead crane. This wide set of hooks slides in under a whole pile of rather limber bars and picks up the whole pile and handles them in a stock yard with no need of a ground man to follow the crane to hook up or release the load. The list of special rigs and cranes is so long as to defy mention of even a small percentage of them.

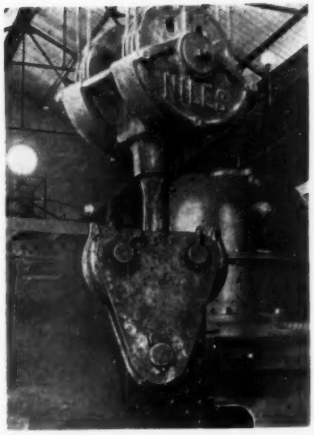


Fig. 3. Shown here is an adapter for a double or tee hook which allows quick changes to single hooks or back to double

Sling Gives Fork Truck a Lift

Contributed by Yale & Towne

HERE'S A handling idea which can be used by any manufacturer of large awkward machinery. The idea requires no extra equipment but adds to the usefulness of existing handling equipment. The Caterpillar Military Engine Co., Decatur, Ill., has conceived and built a special sling for handling heavy odd shaped diesel-motor gear trains.

The sling comprises a piece of channel iron secured to the upper surfaces of the forks by "L" shaped bolts; a hook attached to the center of the channel supports two heavier channels welded back to back and equipped with three chains for attaching the gear train. Two chains with special hooks hang from the extremities of the heavy channels and support the gear train at either side. A third chain, centrally located, supports the nose of the mechanism.

This sling is giving Caterpillar's trucks a lift in handling awkward shapes

AUTOMATIC LUBRICATION
Can Be Metered for Small Machines

By FRANCIS A. WESTBROOK,
Mechanical Engineer

Metered oiling, originally developed to meet needs of large machinery, can now be used on small machinery . . . Different types of lubricators designed for various applications . . . Listing of advantages . . . Cyclic, one-shot, pull-button, lever operated are some of the types described

SMALL SCALE systems of automatic metered lubrication have now been developed and are giving excellent results on small machines such as packaging equipment, business machines, textile machines, motion picture projectors and others. The basic reason is that small equipment must meet the modern service requirements resulting from the high speeds, long runs and heavy loading called for by present day production methods. The automatic metered oiling first developed to provide adequate lubrication to meet similar needs of heavy, and moderately heavy, machinery has been modified so as to be applicable to many types of small machines.

An excellent example of the modern trend is the new model Willcox & Gibbs lockstitch sewing machine. Up-to-date lubrication is very important in insuring uninterrupted production schedules, minimum maintenance and maximum life. These sewing machines have bearings of different sizes and speeds, and loadings also vary. Consequently they need differing amounts of oil at intervals of unfailing regularity, which an automatic metered lubricating system can provide with minimum likelihood of failure.

This small machine runs at a speed of 4200 stitches per minute. Its automatic oiling system consists of an oil reservoir of small size equipped with a pump, called the lubricator, small diameter tubing having branches to all bearings to be lubricated and meter-units for each bearing. The meter-units deliver very accurately measured amounts of oil to the bearings every time the lubricator pump is actuated. A very important detail is that meter-units are used which deliver different amounts of oil according to the needs of each individual bearing.

A meter-unit, shown in Fig. 1, has a filter at the top to catch any foreign matter which may be in the tubing. The metering orifice which measures the desired amount of oil is in the middle of the unit and is the part which may be varied. The orifice, however, is not adjustable, and if it is desired to change the amount of oil delivered to a bearing a meter-unit must be substituted with an orifice of the proper size. A check valve is located at the bottom of the unit which opens when the lubricator pump applies pressure to force oil into the bearing and prevents it from flowing back.

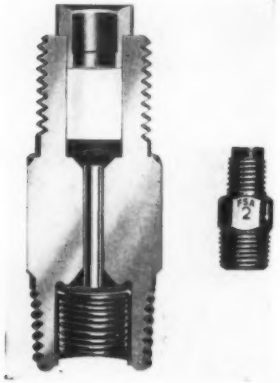


Fig. 1. Meter unit through measured amount of oil is delivered to the bearing

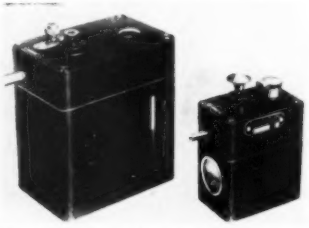


Fig. 2. Cyclic lubricator of the type used on document originating machine shown in Fig. 3

The small diameter distribution tubing does not vary except as to length and number of branches, which depend on how many bearings are to be lubricated.

There are different types of lubricators designed to meet varying service conditions. The cyclic type is used for the sewing machine just referred to. Its pump operates to oil the bearings automatically at predetermined intervals, which in this instance is every 60,000 revolutions of the main shaft. This lubricator is shown at the right in Fig. 2. Its pump produces a pressure in the oil of 30 psi and will care for any number of bearings up to 20. It discharges 12 drops of oil each time it operates. Fifteen bearings are thus served on the sewing machine.

The pump is driven from the main shaft and is mounted on the reservoir. As seen in Fig. 2 there is a pull-button on top of the lubricator, by the operation of which the oil distribution tubing is filled for the first oiling. From then on lubrication of the machine is 100 per cent automatic.

Automatic lubrication has numerous advantages worth noting. Among them are automatic delivery of the proper amount of oil to each bearing according to its individual needs, oiling while the machine is in operation, service of all bearings no matter how inaccessible, delivery of clean oil to each bearing, elimination of accident hazards due to manual oiling, smooth operation due to adequate lubrication, reduction of maintenance costs and saving of labor. Furthermore there is no waste of oil which may drip or spread over the machine and cause damage to materials. These apply in most part to practically all small machine applications of automatic metered lubrication.

Another small machine standardly equipped with a cyclic lubricator is the International Business Machines Corp's. document originating machine. The inside of one of these machines is shown in Fig. 3. This has a larger lubricator because it serves 95 bearings. Its pump is driven from the main motor shaft, as is seen in the photograph, together with the oil distribution tubing.

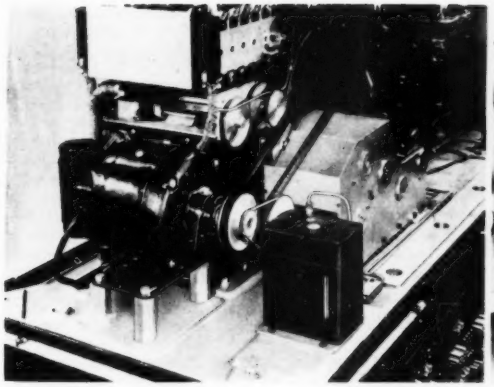


Fig. 3. Cyclic lubricator driven from motor shaft of document originating machine. Note copper tubing

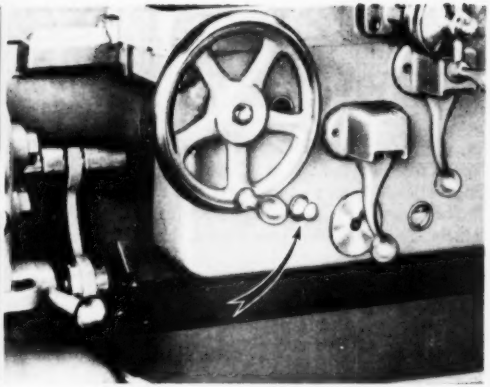


Fig. 6. Arrow points to location of one-shot lubricator on the apron of a small Cincinnati lathe

The large size lubricator used here is shown at the left in Fig. 2. Its pump produces a pressure of 40 psi. It is adjustable to discharge from 2.5 to 5.5 cc each time it is actuated, according to whatever setting is necessary to serve the number and size of bearings of the machine to which it is applied.

In contrast to the two machines just discussed which need oiling at regular, rather frequent intervals there are many others for which oiling is necessary only at comparatively infrequent intervals. For such applications the cyclic type lubricator is not essential. One-shot, or semi-automatic lubricators are suitable in these instances, are less expensive and still provide for closely controlled oiling. They are mechanical in operation in all respects except that the pump is actuated manually.

Figure 4 shows two types of one-shot lubricators, one of which is lever-operated and the other pull-button-operated. The former is designed to care for 20 bearings, or less, and to discharge 30 drops (1 cc) at each shot at a pressure of 30 psi. The latter, or pull-button, type is larger and cares for as many as 40 bearings. It can discharge 60 drops per shot at 30 psi. The volume is adjustable in both types so as to serve different numbers of bearings properly.

There is a third type of one-shot lubricator which is sump-mounted and used to oil a small number of bearings close together which cannot be connected to the main lubricating system. It is shown in Fig. 5, and is actuated by means of a pull-button. There is no reservoir. A typical application is seen in Fig. 6 where the lubricator is mounted in the apron of a small Cincinnati lathe. It oils six bearings of the apron, carriage and cross-slide.

An interesting application of the pull-button type of lubricator is found in the Pneumatic Scale Corp's. rotary top closing machine. Figure 7 shows how it supplies oil to 10 rolls on a spider rotating the main vertical shaft. In other words semi-automatic lubrication is provided for a local compact unit forming part of a large machine.

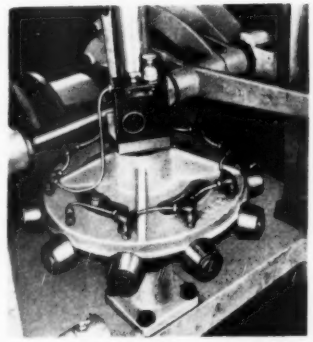


Fig. 7. Close-up of pull-button semi-automatic lubricator for oiling the rolls on the spider rotating main vertical shaft of rotary top closing machine

Fig. 5. One-shot lubricator for sump mounting. It is used to oil a small group of bearings on the Cincinnati lathe (Fig. 6)

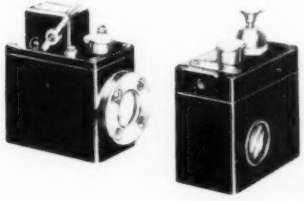


Fig. 4. Pull-button operated lubricator used on a rotary top closing machine (Right) and lever-operated type used on movie projector

One manufacturer produces a 35 mm projector equipped with a lever-operated one-shot lubricator. Six high speed bearings are served from a single line of tubing by this very compact unit which is well suited to the limited space available. The reservoir of the lubricator holds ¼ pint of oil.

It is good policy to consult with the engineers of the manufacturers of automatic and semi-automatic lubricating equipment when deciding what type of lubricator to use on a given machine. All types of oils of greatly differing viscosities can be handled by lubricating systems, so that there need be no limitations in this respect.

Dust Reduction

REDUCING THE volume of dust when a power tool is used to drill or chip concrete floors, calls for use of those old but trusty preventatives—a broom and a pail of water. The broom is plunged into the pail as many times as is deemed necessary. The power tool is then stopped and the wetted broom applied to the exposed surfaces. This serves to check the dust from spreading to anything else on the floor, whether it be workers, machinery or merchandise.

FACTORS AFFECTING V-BELT EFFICIENCY

How much more efficient than a floating drive is a drive with fixed shaft distance? . . . Is it possible to transmit more effective pull at high speeds than at low speeds? . . . What is the effect of centrifugal force, if any? . . . What are recommended pulley diameters? . . . What efficiency should be expected from properly installed V-belt drives?

OBTAINING AND maintaining highest possible efficiencies in all types of driving and driven machinery is a prime responsibility of plant engineering departments. There is a point, however, where the maximum practical efficiency is reached so that the question "How can I get higher efficiency from V-belt drives?" resolves itself into the corollary, "What efficiency can you expect to get?"

Probable performance of mechanical power transmission equipment under field conditions can be predicted with a degree of accuracy from test data compiled in industrial and university laboratories. Manufacturers of V-belts have turned many a midnight sheave in search of reliable data on performance of their products. This article is a combination of facts collected from these two sources.

The results of tests conducted under the supervision of C. A. Norman at Ohio State University and reported to the ASME at its annual meeting, reveal some facts that are startling, and some that are at variance with previous thought. According to these tests a drive with a fixed shaft distance can, so long as the belt has not undergone much permanent stretch, transmit at least a 10 per cent higher effective pull than can a floating drive with total tension set by a tensioning device. As an aid in explaining the findings of this phase of the test stress-strain curves, Fig. 1., were established.

Some belts have curves, it was found, similar to Curve A. With this type of belt an increase in tension on the tight side (from T_0 to T_1) corresponds to a smaller stretch than that which is taken up in an equal amount of tension *drop* on the slack side (from T_1 to T_2). **As load is applied the belt will shorten and, therefore, tighten.**

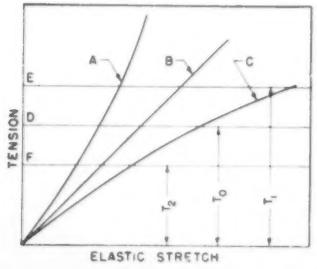


Fig. 1. Typical stress-strain curves established at Ohio State during tests conducted on various types and lengths of V-belts

If the stress-strain relationship is as represented by Curve B the extension of the tight side will equal the shortening of the slack side. **The belt length, in this case, will remain the same.**

If, finally, the curve bends, as does Curve C, the extension on the tight side will be greater than the contraction on the slack side. **Here, the belt will get longer.**

In the tests at Ohio State it was found that the majority of V-belts had curves of type C. In spite of this they transmitted more load with fixed shaft distance than with floating drive. Further investigation was made by arranging the drive as shown in Fig. 2. The driven shaft was mounted on a sliding carrier and connected through a flexible shaft to a prony brake.

From this set-up the following data were obtained: When the tension on the slack side approaches zero, and if excessive slip does not occur, the drive becomes a hoist and the tight side will pull the driven pulley toward the driver. This, of course, increases the slack and decreases the angle of contact on the pulleys so that the slip increases still more and the drive finally breaks down.

To keep the shaft distances constant it was necessary to increase the load L. This, in turn, increases the contact angle as well as the tensions and permits the transmission of a greater effective pull.

Efficiencies at High Speeds

Another important test finding showed that it was possible to transmit more effective pull at high speeds than at low speeds. This phase of the test was conducted with two different lengths of steel cable V-belts, one 96 in., the other 144 in., set at two different initial tensions. The slips, while they increased with the load, did not seem to increase with the speed for constant load, at least not for the 96 in. belt. While steel cable V-belt stretches very little elastically, the same situation obtained for a 144 in. long C-section V-belt, cotton-strand. The values of the slip for the steel V-belt were greater but these values did not increase with the speed for equal effective pulls.

Effect of Centrifugal Force. The effect of centrifugal force on the action of V-belts was another factor that came in for close scrutiny in these tests. It may have much less influence than has been assumed. This is true particularly for belts with small elastic stretch such as those with steel wire transmitting organs. If the belt does not stretch

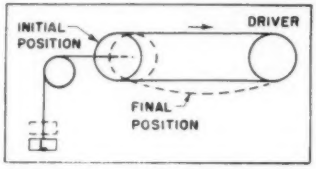


Fig. 2. V-belts and driving and driven pulleys were arranged in this manner to prove one point in the tests

then the intimacy of contact between the belt and the pulley is not changed by the centrifugal tension. The pressure between pulley and belt will be determined by the applied initial tension.

Recommended Pulley Diameters. In viewing the tests solely from the point of view of the torque transmitted it is found that the ratio of pulley diameter to belt thickness should not be less than 12:1. For so-called wedge belts the pulley diameter to belt thickness ratio may be 10:1.

What Efficiency Can Be Expected? Manufacturers of V-belts in a constant effort to improve the performance of their product have run and are running innumerable tests, under all types of conditions. Most of the resultant material and information is of value only to the manufacturers but the end product of these tests plus the knowledge that has come with intimate contact with the field is: The efficiency that can be expected from V-belts when installed and maintained properly. The following information was supplied by some of the leading manufacturers.

From The Gates Rubber Co.

It is hard to give a definite answer on the efficiency of V-belts, though this problem has been discussed in the industry for a long time. We have run, and are still running, tests to determine this value. We have found the efficiency of a V-belt drive will vary over a wide range of values under different conditions. The variables involved are

so numerous it is difficult to express what the efficiency will be under any and all conditions with either a graph or chart.

V-belt efficiency is affected by atmospheric conditions surrounding the drive. These include heat, humidity, and freedom of the air from dust, oil, water or abrasive particles.

Some other factors affecting efficiency are belt construction, types of materials used, and external surfaces of the belt. V-belt construction varies between different manufacturers and so does the efficiency of their belts. The internal arrangements of the materials used will have a separate effect on efficiency. The type of cover as well as whether the belt is an old or a brand new one will have its own effect.

Other factors contributing to the efficiency of a drive are the drive conditions, themselves. The fit of the belts in the grooves, the condition and design of the sheaves, the material used in the manufacture of the sheaves are all factors in this problem. In addition, we must concern ourselves with the coefficient of friction between the belts and the sheaves, the tensioning of the belts, belt lengths, belt speed, sheave sizes, and belt section, when working on this problem.

With all these factors which cannot be easily controlled or measured, and with the wide difference in use to which the belts will be put, we must conduct our experiments under laboratory conditions to determine drive efficiencies under optimum conditions.

Under ideal laboratory conditions we have found the mechanical efficiency of belts and the drive parts to be as follows:

Vulco Ropes—The efficiency of Vulco Ropes is high—98 per cent or better. Highest efficiencies—99 per cent and better have been obtained at catalog horsepower ratings with tension ratios of 8 or 12 to 1. High efficiencies of these types cannot be obtained unless groove angles and dimensions are correct.

Pulleys—Pulley efficiencies are only slightly below 100 per cent but at high speeds (over 5000 ft per minute rim speed) and because of incorrect design, fan action or windage losses will cause considerable drop in the efficiency.

Bearings—Bearing efficiencies vary much more than efficiencies of V-belts or pulleys. It is hardly possible to give any figures except that with high grade ball bearings the bearing losses are probably smaller than with any other bearing. The combined efficiency of one pulley, one bearing, and one set of belts ordinarily can be assumed to be over 98 per cent and for best quality installation, 99 per cent.

Since the efficiency of a motor and the rest of the machinery is probably 90 per cent or less, we believe the loss in the belt drive is insignificant and can be ignored. This is especially true since the efficiency of the rest of the machinery can hardly be estimated closer than 1 or 2 per cent which may be the total loss in the belts.

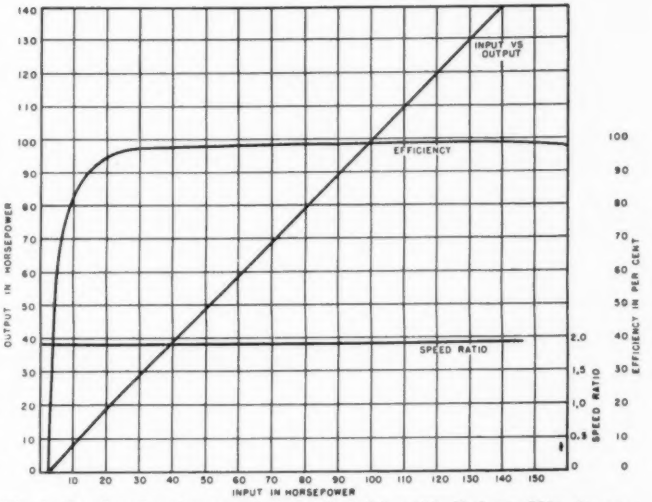


Fig. 3. Results of performance tests conducted by Allis-Chalmers Mfg. Co. on a 125 hp Texrope Drive. The driver was rotating at 800 rpm, the driven pulley at 435 rpm. Belt velocity was 3300 fpm

From The Dayton Rubber Co.

The efficiency of a V-belt drive depends upon a number of factors. Although we have not conducted any recent tests on the efficiency of V-belt drives, comparative V-belt and flat belt efficiency drive tests, conducted by Prof. M. L. Price at Worcester Polytechnic Institute, indicate that maximum efficiency for the flat belt drive was 98½ per cent as against 97½ per cent for the V-belt drive. These results probably represent the highest attainable for the flat belt and the average attainable for the V-belt.

The slightly lower V-belt drive efficiency is probably caused by the wedging loss since the average V-belt bulges when flexed over small pulley diameters. This is particularly true of the conventional wrapper type multiple ply construction V-belt. Our single ply construction cog belts show practically no bulging in flexing and we have good reason to believe that the efficiency of the cog type belt is approximately equal to that of the flat belt. Several of our customers mention their dynamometer tests indicate higher efficiencies for the cog type belt than for the conventional wrapper type belt.

According to recommendations by the Rubber Manufacturers Association, V-belts are designed to operate at a 5:1 tension ratio as against a 2:1 tension ratio for flat belts. In other words, the bearing loads for a flat belt drive will be approximately twice as high. When considering the excessive frictional drag caused by the flat belt tension, the differences in overall efficiency between "V" and flat belt drives will probably not be noticeable at all.

From L. H. Gilmer Co.

Frankly, the question of power loss in any type of transmission is dependent on such an infinite number of factors that there is no significance in stating a flat amount of efficiency for that type of transmission in general.

Where V-belt drives are designed with reasonable efficiency in mind, it is not difficult to attain 95 per cent efficiency or slightly more, so I suppose it could be justly said that V-Belt drives can be made 95 per cent efficient.

In practical application, however, the same is true with V-belts as is true with flat belts, gears, chains, etc. Compromises usually have to be made because of space limitations or desire for compactness, or initial cost, which frequently detract from the maximum efficiency possible.

From Allis-Chalmers Mfg. Co.

Over a period of years we have set up Texrope drives both on our test floors and in the field for the purpose of determining the efficiency of properly designed V-belt drives. The attached curve, Fig. 3, represents a typical case consisting of an 18.0 P.D. 11-D groove sheave, a 33.0 P.D. 11-D groove sheave operating with eleven D-210 Texrope belts.

This drive, the results of which are shown on the attached curve, represents an actual field installation of a motor driving a centrifugal

(Continued on page 57)

SELECTION, USE AND CARE OF TOOLS

Screwdrivers - Types, construction and sharpening

By THOMAS TRAIL

UNDOUBTEDLY the screwdriver is one of the most frequently used maintenance tools in the plant. Even though it is a simple tool, possessing considerable sturdiness, its selection should be given the utmost care.

Screwdrivers are made in a wide range of types, sizes and qualities. Because of the frequent use to which a screwdriver is put and the relatively low cost of even the best makes, it is poor economy to select an inferior grade to save a few pennies.

Screwdriver handles are made in several types by different manufacturers, three different constructions being shown in the upper left hand corner of the accompanying drawing. Some are of the conventional type made of wood pressed onto the blade shank and usually riveted. Others are made of wood but instead of being riveted to the shank, the shank passes through the handle and is riveted on the end. Still other handles are made of some type of plastic or composition molded onto the shank. Pressed tabs on the shank serve to prevent the handle from turning.

Screwdrivers usually come in blade lengths ranging from about 1 to 18 in. The blade shank diameters generally run from 1/16 in. on small instrument screwdrivers to ½ in. on those with 18 in. blades. Shanks are usually round although some are made square so that they may be gripped by a wrench to provide extra leverage.

Blade tips are made in standard and what is known as the cabinet or electrician's pattern. The former is flared, the latter is made the same width as the shank. Both types are shown in the drawing.

In addition to the regular types of screwdrivers there are specially designed styles for use where unusual conditions exist. Offset screwdrivers are made for use in locations where there is no room to use a regular screwdriver of even the shortest length. The blade ends are set at different angles so that the screwdriver may be used even where it can be turned in an arc of only 90 deg.

Another type for use in restricted locations is the right-angled ratchet screwdriver, which requires considerably less than 90 deg. of handle movement for its use. For turning screws in places where insufficient room exists to accommodate an offset or ratchet screwdriver, the flexible shank screwdriver may be used to advantage.

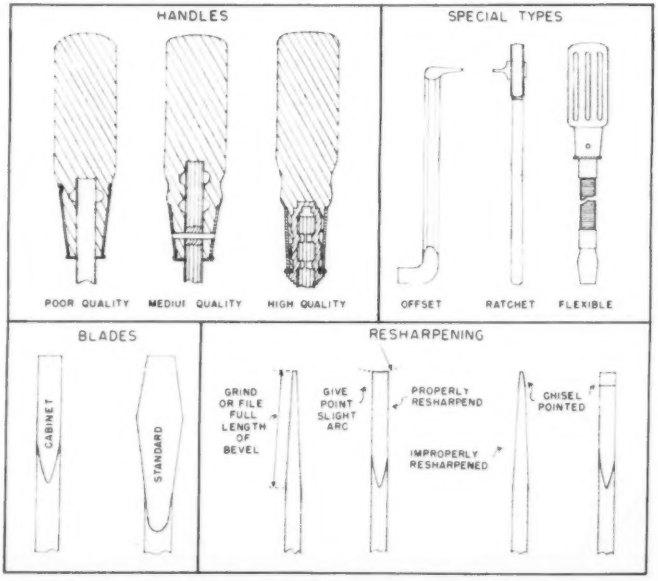
For the average type of shop work about a half-dozen different screwdrivers will usually suffice. These might include: a 6 or 8 in. blade, heavy duty, square shank type; an 8 in. blade, medium duty, round shank, standard blade type; a 4 in. blade, medium duty, round shank, standard blade type; a 1 in. blade, medium duty, standard blade, close quarters type; a 12 in. blade, light duty, electrician's type; and a 2 in. blade, light duty, pocket type. In addition, it will be found convenient to have a ratchet or offset screwdriver, and an instrument screwdriver with a very fine blade, say 1½ in. long by 1/16 in. diam.

In using a screwdriver care should be taken not to damage it. A screwdriver is not made for, and consequently will not serve as efficiently as, a pry bar, chisel, punch or hammer. Some screwdriver handles can be hammered upon without being damaged, others can't, but hard or prolonged blows will roughen any screwdriver handle and damage the blade point. It may sometimes be necessary to strike a few moderate blows on the handle of a screwdriver in order to loosen a stubborn screw, but be sure the handle is a type that won't be damaged in the process.

Caution is necessary in using a composition handled screwdriver around electric arcs or open flames as this type will usually burn rapidly. For live electrical work only fully insulated screwdrivers should be used. These should have an insulated handle and ferrule, and preferably a sleeve insulated shank. The use of through shank and riveted ferrule types is extremely dangerous.

It is necessary to use the proper size screwdriver for each size screw slot. If this is not done the screw may be damaged. Phillips type screws require a special type screwdriver, which is made in four sizes to fit all screws of this type. Where such screws are in use it will be necessary to have screwdrivers of the proper size to fit them.

Resharpening is necessary whenever the point becomes even slightly rounded. The correct manner of resharpening a screwdriver point is explained and illustrated in the lower part of the drawing.



Screwdriver details showing method of handle construction, blade types, special designs and proper method of resharpening

Important Questions..

about iron and steel scrap for every top business man in every industry

Q. *How* bad *is the shortage of scrap?*

A. Actually, we have enough scrap to get along, but too much of it is *light* scrap. What is badly needed today is more *heavy* scrap.

Q. *Why more* heavy *scrap?*

A. Because heavy scrap will produce *more and better* steel in *less* time.

Q. *Why is the heavy scrap shortage so* harmful *to our economy?*

A. Half of all the ingredients that are melted to make steel and castings consists of scrap iron and steel. The short supply of heavy scrap during the past year limited the production of steel mills and foundries. At the present record rate of production, there is still not nearly enough steel to meet the current and anticipated demands of our domestic economy, military requirements, and ERP. More heavy scrap will help bridge the gap.

Q. *What's being* done *about it?*

A. A drive . . . and everybody is cooperating . . . is being started for industrial scrap, to (1) help step up present steel production, and (2) *create a visible reserve of heavy scrap in the event of national emergency.*

Q. Why *is there a shortage of heavy scrap?*

A. Several reasons:

1. Very little of the 123,000,000 tons of steel and steel products exported during the war has come back as scrap.
2. With replacements scarce and expensive, much old equipment which would normally have been junked by now, is still in use.
3. A halt has been called on the junking of old vessels and military equipment which has until recently been a source of scrap.
4. The amount of heavy scrap produced in fabrication —the left-overs of machinery, etc.—is not enough to meet the demand for new steel and castings.

Q. *How about the heavy scrap that must exist in huge quantities in* Germany *and* Japan?

A. Some of this will be coming through, but not in good quantities until preparation and transportation facilities within those countries improve.

Q. *Where can* additional *scrap be obtained from domestic sources?*

A. From industrial plants which have on hand large amounts of heavy scrap in the form of obsolete machinery, idle equipment—tools, dies, jigs, fixtures, etc.—and unnecessarily large repair parts inventories. Such scrap is the best possible type for the manufacture of quality steel.

Q. *Isn't such material* ordinarily *turned in as scrap?*

A. Experience shows that plant "housekeeping" is not particularly good when plant production is high. People are too busy. However, if executives realized the critical situation, they would order the necessary steps to be taken.

Q. *How can I help in this drive?*

A. Appoint one top official in your plant as a Salvage Director —with full authority to give orders and throw out everything that is not going to be needed. Have him consult with your trade association's Steel Scrap Drive Committee. Call in your local scrap dealer. (Incidentally, the prices paid for scrap are the highest ever.) Promote your scrap drive by meetings of department heads and through plant bulletin boards and newspapers.

Q. *How do I benefit from moving scrap in addition to the money received for it?*

A. 1. You get the use of much-needed and expensive floor space now occupied by such equipment and material.
2. You eliminate the cost of keeping records and inventory.

Q. *When does the scrap drive* start?

A. Right this minute. The very next thing to do after reading this page, should be to start *your* plant's scrap drive!

Q. *What is the goal of this drive?*

A. One million tons of *heavy* scrap . . . and "housecleaning" in your plant will help.

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SCRAPPY SAYS:

Search your plant for HEAVY SCRAP ...Help make MORE STEEL!

PLANT ENGINEERING

What? No Steel Scrap!

Well, comparatively speaking, hardly any, even at $50 a ton . . . Heavy steel scrap deliveries must be stepped up 10 per cent or 3 million tons annually to keep steel production at full capacity . . . How is told in the next article . . . If industry wants steel—industry must deliver scrap

SINCE the beginning of the war steel has been critical. Lack of steel has been a major factor in limiting industrial production since the war. Increasing military requirements and exports will tend to aggravate conditions in the future.

Reluctantly the steel industry has made some increase in both ingot and blast furnace production facilities. By the end of the year the ingot capacity should approximate 90,000,000 tons annually. Yet last winter, in the face of critical requirements, some 3 million ingot ton were lost due to lack of scrap! Steel capacity like industrial capacity is useless without raw material.

The outlook for this year is a scrap shortage of about 10 per cent or 3 million tons of purchased scrap. This is scrap needed to utilize fully current steel making capacity.

Due to the very critical situation, the White House in April 1948 asked the Secretary of Commerce to assume responsibility for the problem. An Interdepartmental Scrap Committee was formed to expedite scrap from domestic and foreign sources.

As part of the domestic program, industry groups and trade associations committees were organized. Through the Business Paper Advisory Committee of The Advertising Council a new program was set in motion to salvage steel scrap from industrial sources, from the farms and from the auto wreckers.

In this manner it is hoped to bridge the gap until German and other scrap begins to flow into the country in substantial quantities. During the war some 123,000,000 tons of steel and steel products were shipped abroad. As potential scrap this has been lost. German scrap has been estimated as between 10 and 18 million tons or sufficient to take care of European economy and also provide some for our needs.

Due to international difficulties the movement of this scrap has been slow. Beginning with 4000 t last June, shipments increased to 51,000 in October. European transport difficulties through the winter is expected to reduce the shipments. However, 100,000 t per month has been set as a reasonable figure. This is no more than the scrap contribution of our own auto wrecking industry. In spite of the lush green pastures of foreign scrap, it appears as though industry must of necessity keep going on scrap dug out of the storeroom, back yard and attic.

In the interest of better salvage practice as a dominant factor in promoting the regular and systematic flow of scrap to market, the following article is presented as a case study. This is not a typical case study but an unusual one, where the Salvage Department is run as a business and may well be taken as a model not only for automobile plants but for industry as a whole.

Now are you sure there is no spare scrap around your plant? Recently in the Pontiac plant one man, in his spare time, used a mobile electromagnet to systematically cover the 200 yd area between the salvage building and the foundry. In a week he collected 12 tons of metal!

SALVAGE IS BIG BUSINESS

By F. J. McLAUGHLIN, Exec. Asst. to Gen. Mgr.
Pontiac Motors Div. of General Motors Corp.

Salvage can be either haphazard junk or revenue . . . World War I standards vs modern requirements . . . Equipment, facilities, personnel education and ingenuity needed . . . Department organization . . . Salvage collection, classification, preparation and storage . . . Surplus equipment . . . Repair and reuse . . . Alleviation of the scrap shortage

FOR YEARS, industrial salvage has been a good potential business, big business in fact, although few take the time to consider this viewpoint seriously. To most people the Salvage Department is a place to send junk and unwanted material with no thought of what happens later. Pontiac's experience shows the fallacy of that line of thought. Since the war our Salvage Department has demonstrated that salvage can be made a profitable business in itself, as well as play a vital part in building automobiles from the standpoint of operation, cost and augmenting the available supply of critical metals.

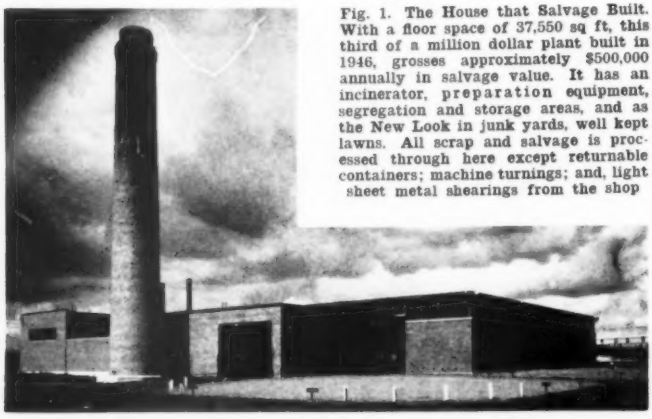


Fig. 1. The House that Salvage Built. With a floor space of 37,550 sq ft, this third of a million dollar plant built in 1946, grosses approximately $500,000 annually in salvage value. It has an incinerator, preparation equipment, segregation and storage areas, and as the New Look in junk yards, well kept lawns. All scrap and salvage is processed through here except returnable containers; machine turnings; and, light sheet metal shearings from the shop

In the post-war expansion program, we included a new salvage building with 37,550 sq ft of floor space. This was completed July 1946 and grosses approximately $500,000 annually in salvage value. Before designing this new salvage building, a careful survey was made of all large salvage departments in the Midwest. Observation of these operations led to the conclusion that, in most cases, practices and methods used 25 yr ago still dominated the business. In other words, the salvage business had not advanced with the thinking of present-day operations. In this building we included a modern incinerator, paper balers, steel balers, shears, overhead loading cranes, etc., so that all kinds of scrap can be handled. Including management and supervision, the Salvage

Department now has 23 employees.

To successfully operate a project of this kind, we selected a man with manufacturing experience so that he could carry into the plant the salvage idea so as to obtain the utmost efficiency in the operation. It is his function to go into the plant, to analyze sources of scrap and see how it can be delivered to the salvage department for the greatest salvage value.

To carry out this program, we also studied the types of containers, trucks or trailers which would efficiently convey scrap materials to the salvage department and fit into the plant operation. We designed and built new dumping steel trailers (see Fig. 7) to meet these requirements and installed machinery for handling. An educational program on the importance of material segregation in the plant where these trailers are loaded was instituted. Currently a trailer is handled every 4½ min. in the Salvage Department, some 70 cu yd of salvage per hour.

During the month of November, 1948, the Department handled and processed: 26 t of steel bales; 380 t of loose steel scrap; 146 t of baled paper; and 54 t of non-ferrous borings and metals. In addition to the above materials, 1127 t of steel bales; 958 t of steel chips; and 1515 t of cast iron borings were shipped direct from our plant to the foundry without processing.

The Salvage Department is carried on the books as a separate department, and separate expense accounts are kept for the accumulation of monthly costs. Records of the activities are maintained for control purposes. Two examples will be adequate to show how the latter are used. A drop in baled paper revenue led to an investigation which disclosed improper segregation as the primary cause. Lumber salvage costs were high. The labor of two men for pulling nails was eliminated by designing and building an automatic nail pulling machine.

Salvage Classification

Salvage material is classified in two categories, dormant scrap and process scrap. Dormant scrap consists of all unused idle equipment, metal which has accumulated to an excessive amount, obsolete machinery, tools, dies and equipment for which there is no immediate or future use. All such material is handled through our clearing house which will be mentioned later. Process scrap is made up of constantly recurring items, such as turnings, borings, clippings, machined work rejected by inspection, short ends, oils, non-ferrous metals, etc. The collection of dormant scrap involves a rapid cleanup of plant and property. It is a long step toward establishing good housekeeping, cleanli-

Fig. 2. Unwieldy pieces are cut up with a torch while smaller and lighter scrap, including the heavy gage skeletons from the punch presses are prepared on shears

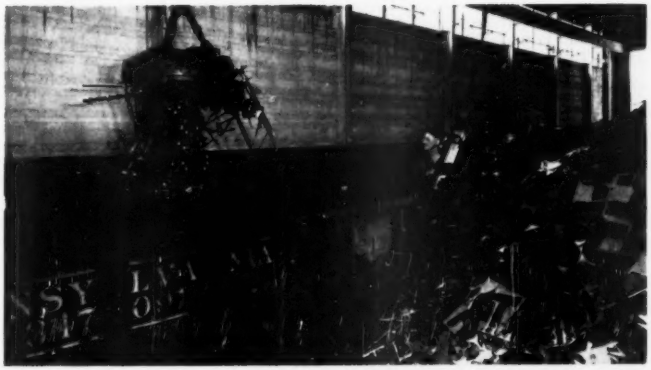


Fig. 3. After preparation and segregation steel scrap is loaded on cars by electromagnets. The pile at the right is heavy plate skeletons sheared to 12 in. lengths for use in open hearth furnaces. This preparation costs $1.00 a ton but adds $3.50 per ton to the scrap value. Preparation is the secret of good salvage

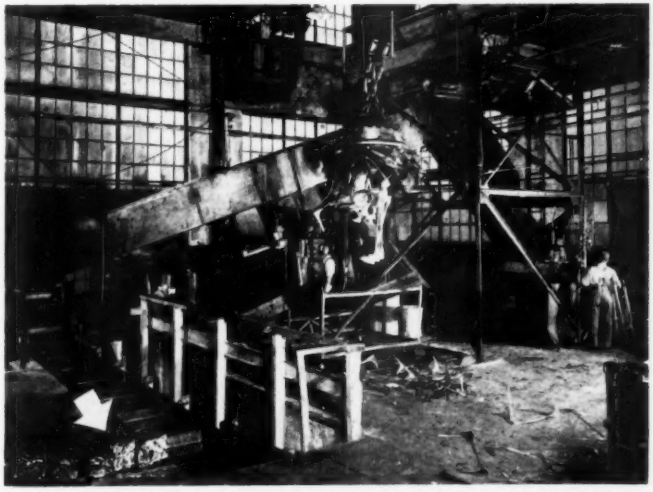


Fig. 4. Light sheet metal shearings are baled (see arrow) and carried by conveyor direct to cars. Scrap is delivered by (1) truck for handling by electromagnet or (2) by the conveyor in the upper right hand corner, hence by gravity chute to the balers. One baler is at the extreme right, the other is just out of the picture at the left. This operation, like the chip preparation, is at the production lines

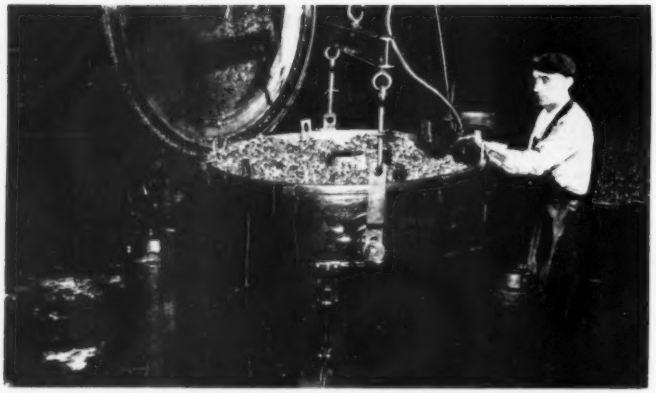


Fig. 5. Machine chips and turnings are processed near the production lines. A centrifuge removes cutting oil which is reclaimed. Chips are then put in a hopper, pass through a hog, where they are broken up, and, then by conveyor are loaded on the railroad cars. At the foundry they are briquetted and used in the cupolas

Fig. 6. Lead and babbit boreings are pressed into bricks. Brass and bronze turnings, carefully segregated, are baled in the paper baler for economical handling

Fig. 7. On an average of every 4½ min one of these specially designed 5.5 cu yd dump trailers is unloaded at the salvage plant. Electric hoists for dumping are provided at 10 locations. Note the cartons at the side of the paper press, saved to use as outer covers for waste paper and brass turnings bales as required

ness and orderliness in various departments. It also helps establish a lasting program.

The value of process scrap lies basically in its proper segregation at the source of production. There are two vitally important reasons for thorough scrap segregation: 1, failure to keep alloy grades segregated means that scarce and essential alloys are lost to industry and appear in remelted metal as contaminants or impurities, rather than useful alloying agents; 2, mixing of low grade with high grade scrap means a loss of revenue to the scrap producer for the price received from the consumer is the price for the lowest grade of scrap contained in the shipment.

It is important that the scrap producer know the exact breakdown of scrap classifications in the market, for by making his own segregation, he increases the net return on his salvage. For example, we used to mutilate bad radiator cores and sell them as scrap copper. By clipping off the intake and outlet pipes and the steel anchor plates, 4 ct per lb was added to the value of the scrap copper.

We have three objectives: 1, to see that all scrap and waste material found and produced is efficiently handled; 2, to obtain maximum reuse and economical value of all scrap; and 3, to eliminate all unnecessary scrap by intelligent observation of scrap sources.

As to the educational program, it is essential that the entire organization be salvage conscious. We made some rules regarding segregation in the plants. Violations of these rules are called to their attention in bulletins. Frequently superintendents of the various departments are invited to the Salvage Department to inspect "horrible examples" collected for that purpose.

Clearing House

There is another function of the Salvage Department which has been established and called a "Clearing House." All supervision in our plants are instructed to remove to the Salvage Department any materials in their particular department for which they have no use. This does not necessarily mean that it is scrapped for it becomes available to other departments because it is now in the clearing house. We have found this particular activity of great value. Without it there would be numerous occasions when new material would be purchased for one department when surplus material was already available in another department.

To illustrate, our Central Stores Department removed as surplus recently a length of flexible tubing which had been in stock for quite sometime and for which they had no need. When Maintenance Stores be-

came aware that this tubing was available they used it immediately. Incidentally, these two departments live next door to one another. The clearing house idea removes from the plant surplus material and helps keep the plant clean. No material arriving at the Salvage Department is scrapped or salvaged until every possible outlet is canvassed.

We are constantly on the alert to extend the salvage activities. We have recently inaugurated a valve recovery program. All air, water and steam valves are rebuilt, tested and returned to the Plant Engineering Department. Scrap copper is prepared for use in cages in the plating tanks instead of cast anodes. A tool salvage program has been in operation for years and cutting tools are prepared for re-use in the plant.

Coke Breeze Recovery

Coke breeze, unavoidable but amounting to 10-12 per cent of the total shipments and formerly unusable in the foundry, is now formed into bricks and used. Further development by enriching these bricks with carbon may actually improve cupola performance as well as save the fuel. Recent experiments indicate that the granulated slag from the cupolas is excellent for cement block giving both increased strength and lighter weight. Experiments are under way to recover the almost pure iron dust from grinders.

GOOD SALVAGE PRACTICE IN A NUTSHELL

First: Collection of scrap from the plant and removal to preparation areas. This involves proper containers, trailers and trucks, plus instructions issued at the source of collection stressing the necessity of proper segregation.

Second: Preparation of scrap for disposal. This involves a study of all methods of reclamation as well as the best type of equipment and machinery for proper segregation and the preparation for disposal.

Third: A temporary storage for materials after removal from the production plants.

Fourth: Determination of whether damaged or rejected parts or materials can be re-used.

Fifth: Periodical collection of dormant scrap, including a monthly survey of all abandoned equipment and material.

Sixth: A clearing house for all departments in the plant where factory furniture, obsolete materials, etc. are made available to other departments before scrapping.

Fig. 8. Over 1500 valves of all sizes are repaired monthly. This is but one of many such activities which includes gloves, leather aprons, brooms and air filler elements. Some of this repair work is done in the building, some is sent out. This is usually on a flat price contract basis to the original source or supplier

Fig. 9. Lumber is salvaged. About 1000 board feet a day are saved and scrap is sold to employees for firewood at a low cost. A nail puller, built like a planer with teeth, is an important feature of this operation. Boxes and kegs are salvaged

Fig. 10. A carload of coke breeze Brick-ettes, a practical method for recovering screenings which amount to 10-12 per cent of total coke shipments and were formerly of no use to foundries. The method, originally proposed by the late W. A. Engelhart, Pontiac's Salvage Engineer, utilizes cement block equipment for forming the brickette with 5 per cent cement and a final curing with steam

Make Your Inquiries For Centrifugal Pumps Complete

Part III* Factors involved in selecting a centrifugal pump in relation to specific services and its individual requirements . . . Boiler feed pumps . . . Condensate service . . . Chemical service . . . Hydraulic pressure service . . . Mining service . . . Hot and cold oils . . . Volatile fractions . . . Pipeline service . . . Process and paper pulp service . . . Water works, service . . . Not all factors assume equal importance

By IGOR J. KARASSIK and ROY CARTER
Application Engineers, Worthington Pump & Mach. Corp.

PARTS I AND II discussed in a general manner information which it is necessary to collect prior to preparing an inquiry for centrifugal pumping equipment. These points were arranged under 11 general topic headings.

Knowledge of the separate factors outlined there is a prerequisite to an intelligent analysis of the problem and to its solution. Not all the factors, however, assume an equal importance for all the various services under which centrifugal pump applications can be classified.

In order to illustrate these differences in the order of importance, there has been selected a series of representative services most commonly encountered. Under each is listed the most important points to be examined. In all cases, it is understood that the type of drive and its characteristics are an integral portion of the required information.

Boiler Feed Service

A. Discharge pressure preferably. If not available the boiler pressure permitting discharge pressure to be estimated.

B. Capacity in gallons per minute or in pounds per hour: maximum, minimum; and, normal.

C. Temperature of feedwater and possible variations.

D. Suction conditions, including variations in suction pressure and minimum available net positive suction head.

E. Chemical analysis of feedwater, if not complete, at least with reference to pH.

F. Type of regulation.

G. If possible a complete layout of the feedwater system and the heat balance diagram.

Condensate Service

A. Capacity in gallons per minute or in pounds per hour: maximum; minimum; and, normal.

B. Suction conditions, including vacuum in hot well, minimum available submergence and expected variations.

C. Discharge pressure: maximum; minimum; and, normal. If complex conditions prevail include system-head curve.

D. Type of system, open or closed. In other words does the condensate pump discharge into a surge tank or into the suction of a boiler feed pump.

Chemical Service

A. What is the nature of the liquid? Acid or alkaline? What is the concentration of the solution?

B. Does it contain solids in suspension and are they abrasive?

C. What is the pumping temperature and vapor pressure or boiling point. What is possible or expected variation?

D. What is the specific gravity and viscosity at pumping temperature?

E. What is the capacity: maximum; minimum; and, normal.

F. What are the discharge conditions.

G. What are the suction conditions. What is method used to prime pump if there is a suction lift? Can change in pump location be made to arrange for operation under submergence if suction lift is impractical? Or to reduce positive suction head if sealing the stuffing box is impractical?

H. What are special stuffing box requirements? That is local practice with respect to packing, sealing methods, effect of dilution by sealing fluids, etc.

I. What is past experience with various materials or combinations of materials handling this liquid?

Hydraulic Pressure Service

A. What is the liquid used — water or oil?

B. What is the capacity; maximum; minimum; and normal.

C. What are the total head conditions? That is what static head.

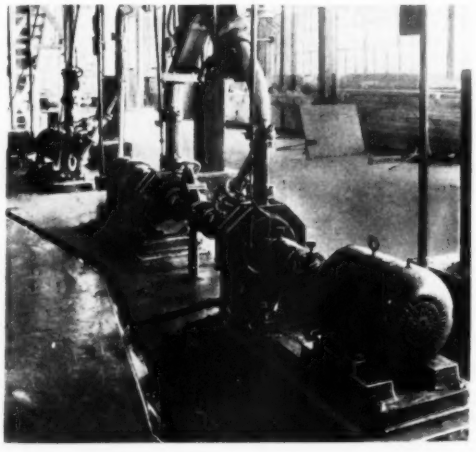


Fig. 10. **Chemical pumps handling hot dilute sulfuric acid and slurry. Note the well lighted, clean and accessible location and the radially split casing**

* Conclusion of a three part article. Part I appeared in the November issue, page 23 and Part II in the December issue, page 28. Republication rights reserved by the authors.

friction losses and pressures to be maintained.

D. What are the suction conditions?

E. What type of pressure system? Does pump discharge directly to press or nozzles or does it discharge

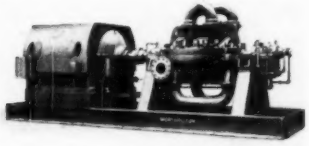


Fig. 11. Typical axially split casing generally used for general service centrifugal pumps and for some other types. This is a volute type boiler feed pump for pressures to 1300 psi

through an accumulator? A sketch of the installation is very helpful.

F. What type of control? If an accumulator is used does it maintain a constant pressure automatically, is the pump shut down during the no-load operation or is it operated at no flow. If the latter, what arrangements are used for protecting the pump against overheating, i.e., what controls the by-pass recirculation?

Mining Service

A. What is the nature of mine water and chemical analysis? Note the presence or absence of suspended materials and the abrasive quality of the solids in suspension.

B. What are the capacity requirements?

C. What is the discharge pressure, subdivided into static head and friction losses?

D. What are the suction conditions?

E. Location of installation. Is space occupied an important factor? What are the size limitations imposed by transportation through the mine shaft?

F. What special consideration need be given to the drivers? Is special insulation or enclosure necessary for the electric motors?

G. What is previous experience with centrifugal pumps handling this mine water? What materials stood up best, which ones proved unsuitable?

General and Cold Oil

A. Note the nature and give a complete description of liquid to be handled, including specific gravity over the range of pumping temperatures.

B. What is the capacity: maximum; minimum; and, normal?

C. What are the suction conditions with special consideration to Net Positive Suction Head (NPSH)?

D. What are the discharge conditions?

E. What is the viscosity and variations if any?

F. What are the corrosive and abrasive properties of liquid?

G. What is the type of service relative to pump control?

Hot Oil

A to G as above and, in addition:

H. What is the range of pumping temperatures?

I. What is the vapor pressure at pumping temperatures?

J. What is the correction of capacity on hot or cold operating range and resulting effect on power consumption with reference to possible driver overload?

K. What special stuffing box requirements? Note such factors as local practice with respect to mechanical seals, pressure-sealing arrangements, smothering glands, etc.

Volatile Fractions

These cover ethanes, propanes, butanes, gasolines, kerosenes, and other light fractions. Note particularly A to G as above and, in addition:

H. What is the range of pumping temperatures?

I. What is the vapor pressure at pumping temperatures?

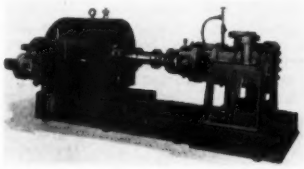


Fig. 12. A 2 stage refinery pump, driven by a steam turbine. Note the radially-split casing and centerline support typical for this type service

J. What is the special stuffing box requirements? (See above.)

K. What is the local practice with reference to protection against fire hazards (fire-walls, special driver enclosures, etc.)?

Pipeline Service

A to G as above and, in addition:

H. Give a graphical representation of required pressure gradients for the entire pipeline.

I. What are possible variations in capacity or in the nature of products handled?

J. What is the method of operation, manual or automatic control?

K. What are special stuffing box requirements? (See above).

L. What is local practice with reference to fire hazard?

M. Is local preference for series or single or multiple units?

Process and Paper Pulp Service

(This includes sugar, brine, brewery, food paper stock, and similar uses.)

A. What is the nature of the liquid?

B. Is it acid or alkaline?

C. Is it clear or does it carry solids in suspension? Are these solids carried by floating or through agitation and flow? Are the solids inert or are they subject to dewatering or swelling? What is the consistency?

D. What are pumping temperatures?

E. What is the specific gravity and viscosity at pumping temperature?

F. What is the capacity: maximum; minimum; and, normal?

G. What are discharge conditions?

H. What are suction conditions?

I. Are there any sanitary precautions to be observed? Any local preferences for specific details or materials of construction?

Sewage and Drainage

A. What is the operating head range or system characteristics?

B. What is the capacity at average or design head with limitations, if any, at other heads?

C. What are suction conditions? Give full information on how they vary with total head, capacity or both.

D. What is the setting of the pump, vertical or horizontal?

E. What is the maximum size and character of solids to be handled.

F. Give information as to the character of the liquid and presence of abrasive material.

Water Works, Irrigation Service

A. What is the design capacity? Also range in capacity if direct pumpage is into mains or limitations necessary for heads other than design?

B. What is the operating head range or system characteristics, if not a constant pressure system?

C. What are the suction conditions? Give full information on how they vary with total head, capacity or both?

D. What is the load factor and cost or evaluation of power?

E. Give information as to the character of the water and possible presence of sand, silt or grit.

F. What is the performance characteristics of existing pumps, if any, with which the new pumps will have to operate in parallel?

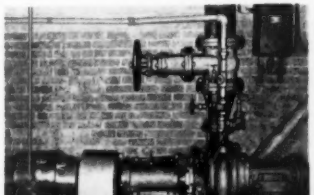


Fig. 13. A paper stock pump. These pump casings are generally diagonally split

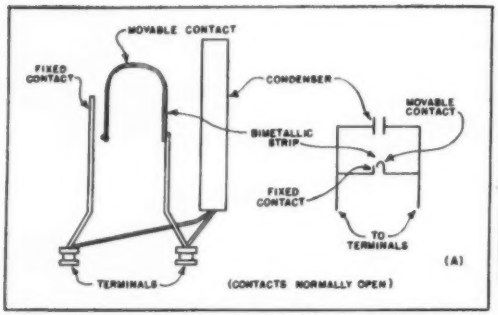


Fig. 1. A glow-switch starter with the glass bulb removed

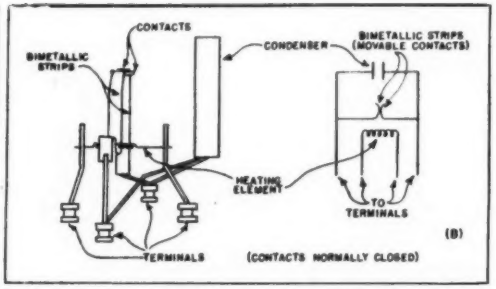


Fig. 2. A thermal switch starter, also with the glass bulb removed. This serves the same purpose as the glow switch

Fluorescent Lamp Operation

By JOHN FOSTER

A FLUORESCENT LAMP consists of a glass tube sealed at both ends. At each end two pin type contacts on the outside connect with a small filament on the inside. These filaments serve as electrodes and are coated with a material that emits electrons when heated. Each filament is fitted with a piece of heavy wire that fulfills the function of an anode.

The inside surface of the tube is coated with a phosphor powder. The tube contains a small quantity of mercury and is filled with argon gas. The construction of the tube is shown in Fig. 3.

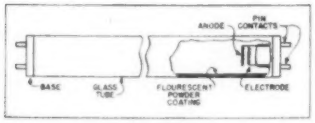


Fig. 3. Construction of fluorescent lamp is shown in this drawing

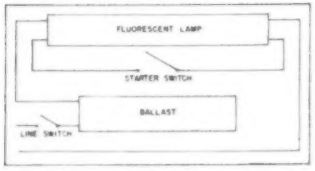


Fig. 4. Shown here, diagrammatically, is a simple fluorescent lamp circuit

Figure 4 shows a simple fluorescent lamp circuit. In operation, when the switch is closed, a small quantity of current flows from one side of the line through the electrode at one end of the lamp, through the glow-switch starter, through the electrode at the other end of the lamp and returns to the other side of the line. The current flowing through the starter heats a bimetallic contact strip and causes it to bend, thus closing the starter contacts. This permits a larger flow of current through the circuit, heating the electrodes and causing them to give off a cloud of electrons.

The closing of the starter contacts, in the meantime, bypasses the current through the starter, and the bimetallic strip begins to cool. When the strip cools sufficiently it opens the starter contacts and interrupts the flow of current through the lamp circuit.

This action causes the ballast to produce a high voltage surge of current that bridges the gap from one electrode to the other, thus establishing an arc stream through the argon gas and mercury vapor. Though current no longer flows through the electrodes, they continue to give off electrons because they are heated by the impact of the arc stream between them, maintained by the flow of current through the tube from one electrode to the other.

As the polarity of the alternating current changes, the polarity of each electrode is changed and the electrons surge back and forth through the tube at tremendous speed. In this way they bump into the atoms of mercury and argon gas in the tube and displace some of the mercury electrons. As the mercury electrons snap back into their proper place they produce ultra-violet radiation. While this produces little light, the ultra-violet radiation activates the phosphor coating on the walls of the tube and thus produces fluorescence, the visible light seen in the fluorescent lamp.

The operation is the same when a thermal-switch starter is used instead of a glow-switch type, except that the starter contacts are normally closed, and open after a pre-determined heating period to provide the high voltage starting surge. The operating current of the lamp then keeps the thermal switch open by keeping the bimetallic strip heated. Both types of starters are shown in Figs. 3 and 4.

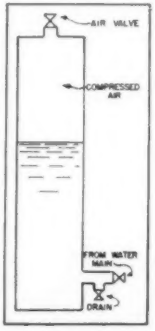
From this it will be seen that there are several pieces of equipment that must function properly to produce fluorescent light. The failure of any one of them will prevent the others from operating properly, and, in certain instances, may cause damage to the other parts.

Emergency Compressor

Contributed by
W. F. Schaphorst

OCCASIONALLY an emergency supply of compressed air is needed. If water pressure and an old pressure vessel is available this emergency supply of air can be provided quickly by means of a few pieces of pipe and fittings. It would never take the place of a compressor, however.

The sketch shows how an ordinary water tank can be used for this purpose. The operation is simple: Close the air valve at the top and open the water valve. The air trapped in the vessel will be compressed to the same pressure as in the water main. The operation, of course, is intermittent because when the tank is full of water, the water has to be shut off, the drain opened, and the process repeated.



How to File Catalogs Systematically

By JOHN D. BREEDING

Compact and easy to maintain the simple filing system outlined will pay dividends with little effort . . . Subject index . . . Alphabetical file . . . Local representatives list . . . Starting the file and keeping it

PRACTICALLY all Plant Engineering Departments at one time or another wished they could find quickly the catalog from some particular supplier, or, all available catalogs covering some specific type of equipment. Very often the only way is to rely on one's memory or leaf haphazardly through a pile of catalogs.

The following system can be made invaluable. It has been used over a long period of time and has proved to be a simple, practical and effective answer to the catalog problem. It is complete, compact, easy to use and above all it gives order and accessibility to catalogs at hand. Further, it takes but a small amount of work to keep it up to date and ready for immediate reference.

This system is composed of two main parts: first, a card file of types of equipment arranged alphabetically; second, a file of manila folders containing the catalogs and also arranged alphabetically but this time by manufacturer's names.

The card file is set up with a card for each specific type of equipment covered by the catalogs available. As an example, a card might be titled "Speed Reducers." On this card would be listed the names, addresses, dates and identification of catalogs on hand for all manufacturers making this type of equipment. Figure I illustrates a card of this type.

Occasionally a situation will arise where the catalog contains more than one type of equipment. In this case the name is merely listed on several cards, one for each type of equipment contained in the catalog.

These cards are then filed alphabetically in a small file box and are handy for ready reference. The writer has found the standard 4 by 6 in. card to be quite satisfactory for this purpose. From this it is apparent that one has only to turn the card file to a given type of equipment and the listing of catalogs on hand is available for use.

The second section is nothing more than standard 9½ by 11¾ in. manila folders titled with the name of the manufacturer. These folders are filed alphabetically so that once the name of the company has been determined from the card file it can be quickly located in the catalog file.

As a further step in increasing the efficiency of this system, the names of the local distributors, their addresses, local salesman's name and telephone number are entered in the front of each catalog or folder as it is received. Often the salesman's card will be sufficient for this purpose and is easy to staple it in place.

In initiating such a system it is best to use only the catalogs at hand as a nucleus. There is, however, no limit to which it may be expanded. If it is desired to make a more elaborate system one may refer to one of the various directories for ideas as to card titles.[1] In any event the only concern is with the types of equipment actually used in a particular plant. There is little use in making the system burdensome by the inclusion of superfluous material.

Once this simple system is placed in operation, it is an easy task for a filing clerk or stenographer to handle the filing and keep it up to date. Thus all persons, having need for quick access to catalogs will find it rapid and easy to use.

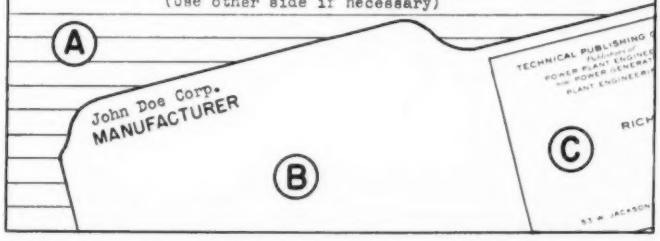
Not only will the Plant Engineering Department find such a system invaluable, but also architects, designing engineers, draftsmen, etc. It is a quick, orderly and neat method for handling catalogs which are usually scattered hither and yon so that they are never available when needed.

[1] EDITORS NOTE: Those interested in a more complete file or equipment breakdown will find the AIA filing classification of value. It is similar to the Dewey Decimal System and is widely used by manufacturers for catalog classification. The breakdown of building materials, heating and ventilating equipment and certain phases of electrical and power plant equipment is detailed and, of course, can easily be expanded to meet specific needs. It is known as AIA Document 172 and is for sale by the American Institute of Architects, 1741 New York Avenue, Washington 6, D. C. The price is $2.00 per copy.

SUBJECT SPEED REDUCERS

MANUFACTURER	ADDRESS	NUMBER	DATE
John Doe Corp.	Chicago, Ill.	B-842	2-46
Frank Doe, Inc.	Cleveland, O.	18L	1-47
Albert Doe Co.	Kansas City, Mo.	-	6-48

(Use other side if necessary)



This simple card index and catalog file will put catalogs to work. The card file (A) lists all catalogs for a single item. The catalogs are filed in manila folders (B) arranged alphabetically by company name with (C) representatives cards

Plastic Building Blocks

Contributed by Monsanto Chemical Co.

PLASTIC partition blocks resembling glass brick but only one-fifth the weight of its glass counterpart are available.

The partition blocks are made with interlocking lips permitting non-load bearing walls to be built without using adhesive or clamps. In many locations this would permit the use of temporary wall partitions which could be quickly assembled or taken down.

The blocks are 7¾ in. square and almost 4 in. thick, and weigh slightly more than a pound each. The two faces of the blocks have facets molded into the inside surfaces so that the finished block diffuses light.

Mastic cement or wood strips between the blocks can be used to make a permanent wall. Temporary installation can be made with only a wood framework for bracing. Glass blocks are usually installed in such a manner that they carry only their own weight. A similar practice is necessary with the plastic blocks. They are recommended only for interiors at the present.

Radiant Heated Ramp Keeps Plant Traffic Going

By ARTHUR CAMPBELL,
Plant Engineer, Bigelow-Sanford Carpet Co.

TO FACILITATE movement of materials and finished products between plant buildings by industrial trucks, the plant engineering staff at the Bigelow-Sanford Carpet Co., Inc., factory in Amsterdam, N. Y., designed an outside 85-ft long concrete ramp leading from the building basement to the street.

Topography of the area made it necessary to build the ramp on a 10 per cent grade and install a 30-deg turn. The problem, however, was not so much how to construct the ramp as it was to decide what to do about its use during winter.

In that part of New York state, snowfalls are frequent and heavy. Snow or ice on the ramp would obviate its use by industrial trucks and delay production or shipping operations. Keeping the ramp free of ice and snow would constitute a major — and costly — maintenance item.

The problem was solved by designing and installing a network of pipe coils in the 8-in. crushed rock fill underlying the 6-in. concrete slab.

Hot water, heated by a convertor on the plant's steam line, is forced through the coils by a pump to keep the pavement warm and thus melt snow as quickly as it falls and prevent ice from forming. Last winter, snow depth ranged from 18 to 30 in. but the system worked to perfection. The pavement remained clean and dry without the use of snow shovels or chemicals. Fuel costs were estimated to be low although no definite check was ever made.

At the top and bottom of the 9-ft wide ramp, catch-basin type drains are installed to carry away residual water and normal storm drainage. The drain pipes are 8-in. wrought iron. Heating pipes also are run through the catch basins to minimize possibility of the drains freezing. Anti-freeze is added to the water used in this closed system to prevent freeze-up during non-operating periods which often occur in snowless periods of low temperatures.

The wrought iron pipes—used because they resist corrosion — are welded together in the form of a grid.

They are cold-bent where necessary to follow the slope and curve of the ramp. Header pipes and supply and return mains are 2-in. and the grid pipes, spaced 13½ in. apart between the headers, are 1¼ in. pipe.

With this pipe spacing, and an operating water temperature of 130 F, the system is designated to melt snow at a rate of 2 in. per hour. If the system is turned on when snow starts to fall, the temperature of the pavement is raised sufficiently to melt the flakes upon contact. A vent line, with a manually operated air valve, is installed in the high point of the piping layout.

Fig. 2. This picture shows the effectiveness of the radiant heating in keeping the ramp free from snow and ice. Hot water pipe coils are embedded in a crushed rock fill underlying the 6-in. pavement

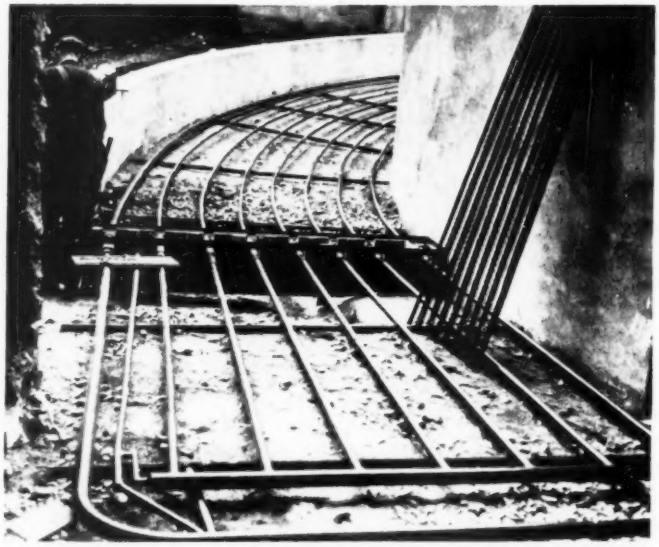
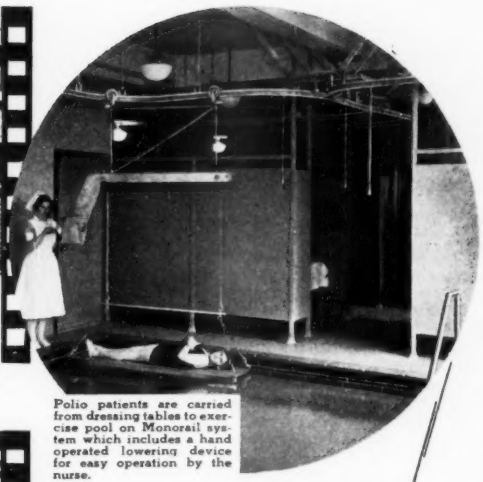


Fig. 1. This closeup shows grid header pipe at foot of ramp. Grid pipes run through catch basin to prevent drainage water from freezing. Residual water from melted snow and normal rain drainage is carried off through 8 in. drain pipe

Another demonstration of the MonoTractor drive includes a swinging jib for passage of the carrier over a truck for removal of 2 ton bundles of sheet steel. An electric hoist and a Windsor sheet grab are used.



Polio patients are carried from dressing tables to exercise pool on Monorail system which includes a hand operated lowering device for easy operation by the nurse.

This twin-bridge 5 ton crane is 160 feet long operating on 9 runways. Two carriers, each centered between a pair of crane trucks, can make a lift of 10 tons as shown.

Fruit, unloaded from cars on special trolley racks, rolls around MonoRail curve to a drop section where the racks are lowered to basement tracks. The racks then roll by gravity to ripening rooms.

Try

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Our 16 mm black and white twenty minute sound picture will bring to you the complete story of American MonoRail overhead handling. If you are in the market for any material handling equipment, see our movie first. We will gladly loan you the film for showing in your offices at a time most suited to your convenience. Please drop us a line.

*UP and OVER is the title of our 20 minute 16 mm sound film.

THE AMERICAN MONORAIL COMPANY

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Maintenance and Operation

Plant Seismograph Records Vibration

Contributed by Westinghouse Elec. Corp.

A NEW TOOL to help engineers in their continuing battle against vibration—a portable "seismograph" for use in industry—has been developed.

The first application has been made in measuring the vibration of walls in a textile mill. Because of its compactness and easy portability, it is expected that the instrument may be used to analyze vibration problems on machinery and other equipment as well.

The industrial "seismograph," so-called because it utilizes the same principle employed in instruments registering earthquake shock, is a combination of a special seismic pendulum mounting designed and manufactured by The Barry Corp. and the Westinghouse Vibrograph.

The Vibrograph, about the size of an ordinary box camera, ordinarily embosses a permanent record of vibrations on a transparent film. It records over the range of 600 to 15,000 cycles per minute and amplitudes as low as one ten thousandths of an inch or as great as one sixteenth of an inch. Mounted in the Barry frame, vibrations with a frequency as low as 120 cycles per minute can be measured even in swaying buildings where no steady reference point is available.

The Barry seismic pendulum provides a Vibrograph support whose natural frequency is lower than the frequency of the vibration to be measured. The Vibrograph thus tends to remain stationary in space. The pendulum is comprised of a triangular arm supported from a vertical column by means of frictionless elastic hinges. The low natural frequency is attained by mounting the Vibrograph relatively close to the hinges and setting a large mass in a pan at the free end of the arm. The Vibrograph includes a prod adapted to contact the structure whose vibration is to be measured. This contact is achieved, in the case of the wall of a building, by setting the seismic pendulum in such a position that the prod contacts the wall.

The new portable "seismograph" to analyze vibrations with frequencies as low as two cycles per second. In the picture the "seismograph" is set up to analyze the vibration effects of heavy machinery on factory walls

Welding Fumes Moved by Heater

Contributed by Dravo Corp.

WELDING FUMES are being effectively removed from a block-long Chicago factory building without the use of exhaust fans or an elaborate air conditioning system, by means of four high-velocity, direct-fired heating units. The building is the Chicago plant of Dreis and Krump Manufacturing Co., one of the nation's largest makers of forming dies and steel press brakes. Dreis & Krump built this factory 25 years ago. It is 480 ft long by 95 ft wide with brick walls, wood roof and concrete floor. An open balcony extends around part of the building.

During the summer months, natural draft from open windows and doors carries away most of the welding fumes through high (39 ft) bay windows. The existing steam-fed suspended space heaters, however, were inadequate to compete with the draft during the winter. In addition, large quantities of warm air were lost through the roof. The working zone became uncomfortably cool and an excessive amount of fuel oil had to be used. Moreover, the factory frequently became so "foggy" that visibility was impaired.

The new method of ventilating, as worked out by the firm's engineers, is effective in both summer and winter because the same equipment is adaptable for use irrespective of season. The objective is to bring sufficient quantities of fresh air into the building to keep the working area under pressure thereby helping to expel welding fumes out of the high windows.

In the winter, the cold air is warmed by four direct-fired heaters, fueled by oil, installed in the plant. Each heater has a capacity of 2,000,000 Btu per hour. Air is drawn into the heaters through louvered openings in their bases. Each heater is capable of handling about 22,000 cfm.

The air is first passed over two staggered banks of economizer tubes leading from the combustion chamber to the vent stack. The pre-heated air then sweeps the stainless steel combustion chamber and is discharged into the working area at a velocity of approximately 2000 fpm. Temperature of the air entering the heater is raised in the process approximately 80 deg before being discharged. The four louvered, directional discharge nozzles on the heaters are 12 ft above the floor.

As the warmed air is blown into the working zone of the factory, welding fumes are forced up to the roof windows. In the summer, only the fans in the heaters need to be operated and the ventilation is equally effective.

Installation of the equipment was a simple operation. Each heater being self-contained, required only power line, vent stack, fuel line and

HERE COMES THE

Trumbull Train

OF ELECTRICAL PROGRESS

A whole parade of new Trumbull products is headed your way! A new advancement in the entire line of Trumbull products — Flex-A-Power systems, Panel Boards, Control Centers, Switches and Motor Starters — all radically different. So watch for Trumbull's new product announcements during 1949. Here's the first —

A NEW

Magnetic Motor Starter and Magnetic Contactor

New, from top to bottom, Trumbull Starters and Contactors in sizes 0, 1, 2, 3 give maximum protection to motors up to 50 hp, 440 v. Look at all their important new advantages:

LONGER CONTACT LIFE —
Actual factory tests show the silver contacts on the Trumbull starter "make and break" for millions of operations — many times more than any starter on the market.

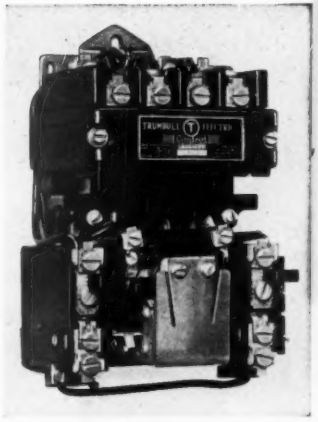
EASY TO MAINTAIN —
Silver contacts have permanently attached springs that are easy to remove. Terminals are located on the front and are easy to wire — a screw driver is all you need to disassemble starter — can be accomplished in less than a minute.

EASY TO INSTALL AND SERVICE —
Note convenient knockouts, large terminals, front connections, and ample wiring space.

GREATER PROTECTION —
Bi-metallic relay heaters follow motor's heating curve. Easily adjusted for automatic or manual reset.

BUILT TO LAST —
All parts resist corrosion and moisture. Examine plastic coil enclosure to see how the tough varnish impregnation protects windings. Contact points and cold-molded asbestos arc hood eliminate arcing . . . give clean "make and break" contact.

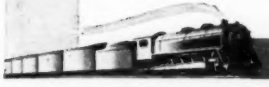
QUIET OPERATION —
Permanent lubricant impregnated in the plastic coil enclosure keeps magnet guides sliding smoothly . . . eliminates low voltage "chatter."



FOR MORE INFORMATION about this latest Trumbull development, write for Circular TEC 11. THE TRUMBULL ELECTRIC MANUFACTURING CO., Plainville, Conn. Other factories and offices throughout the United States. Foreign representation.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC



TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

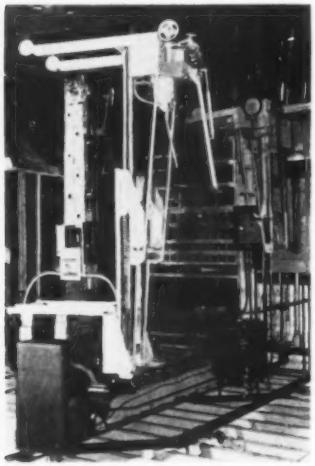
intake duct. Two of the heaters are mounted together at one end of the building, another is placed at the opposite end and the fourth serves as annex.

High Lift Truck Helps in Installation

Contributed by Lyon-Raymond Corp.

THE OVERHEAD installation of unit heaters has always presented a difficult problem. The heavy units have been raised successfully by block and tackle so that they could be fastened to the supporting fixtures. This method of elevating the heaters, however, requires an auxiliary hook to first be placed in the ceiling to hold the block and tackle. On finished ceilings this presents a special problem because it is not always possible to install such a hook.

Unit heaters are also placed into position by being raised up to scaffolds previously built. Various methods were used, all dangerous to the workers and making slow, time-consuming jobs.



Unit heaters are but one type of installation or overhead job that can be done with lift trucks

The use of a hydraulic high lift truck has simplified this and other difficult installations of heavy overhead fixtures. The platform of this truck lowers to 6 in. and raises as high as 108 in. The heavy unit can be loaded on the truck platform from the tailgate of a motor truck or, from the floor of the storage area, and wheeled to a spot directly under the place where it is to be installed. The truck is then locked into place by means of a floor lock and the fixture is raised into exact position by means of a hand or power operated hydraulic pump.

You Want Gray Machines?

Contributed by American Standards Assn.

FOUR SHADES of gray for use in painting industrial machinery and equipment are recommended in a proposed standard for Gray Finishes for Industrial Apparatus and Equipment now being circulated by American Standards Assn., for comment and trial use. Although the standard does not recommend that gray necessarily be used, it does suggest that when industrial apparatus is painted gray the use of these standard shades will help in matching the shade desired and in providing better color harmony.

The four standard grays are described according to number and Munsell notation since it is expected that for industrial use the exact identification will be desired. For the convenience of individuals, however, color chips have been prepared so that anyone interested can visualize what the color described will look like on his machines. These color chips can also be used in making a quick visual check or comparison of the colors. They may be obtained, for $1.00 per set, from the Association, 70 E. 45th St., New York, N. Y.

The four standard grays recommended are: Light gray; medium light gray (or standard machine tool gray 7-B); medium dark gray and dark gray.

New CO_2 System Boon to Fire Safety

Contributed by Carbon Dioxide Fire Protection Industry

WAREHOUSES, industry and agriculture will soon be hearing about a new system of carbon dioxide fire protection combined with smoke-detecting equipment.

While tests conducted by the Underwriters' Laboratories established the device as one of the fastest and most effective means of detecting and extinguishing fires in fur storage vaults, the system would serve to protect almost any stored materials in confined or semi-enclosed spaces.

A distinguishing feature of the carbon dioxide system is that its use automatically eliminates the cost and inconvenience of water damage. The new fire protection equipment utilizes approved equipment to detect the smoke or fire at its inception and releases dry and non-damaging carbon dioxide gas for complete extinguishment. In a series of five tests, Underwriters' Laboratories established that the system thoroughly put out fires originating in both the interior and exterior of densely packed furs faster than any other means heretofore tested.

The smoke detector used in the test employed a super-sensitive photo-electric cell to discover the presence of smoke. In one of the tests, the detector actuated 38 seconds after a fire in the vault was ignited and that after eight minutes visibility in the vault had cleared and no flames were noted.

A rate-of-rise fire detector was also employed in the tests, according to the U. L. published report. This heat detector, designed to operate when the heat of a fire or rapid temperature rise exceeds a predetermined rate, actuated within 46 seconds after a fast burning external fire was ignited in the vault. Both devices, the smoke detecting and heat detecting systems, are standard equipment of the protection system and can sound a fire alarm or discharge carbon dioxide automatically for fire extinguishing.

In industry the device will provide a twenty-four hour watch over high-valued materials such as patterns, engineering drawings, important records and electric stairways. Agriculture will benefit from the system when the equipment is installed to protect seed and other storage.

From Wood to Sawdust, Back Again

Contributed by Monsanto Chemical Co.

SAWDUST AND wood chips can be easily made back into usable forms of wood with only the addition of minor amounts of a plastics material.

The resulting pressed boards can be sawed, turned and otherwise handled like wood, according to Monsanto Chemical Co. The material has no grain and is therefore not subject to splitting. In weight, the product is essentially the same as the wood from which the sawdust comes. The material is at least as strong as wood in its weakest direction.

In addition, considerably better dimensional stability and water resistance can be expected because the plastic content acts not only as a binder but also improves the water resistance of the wood fibers themselves. It is a simple matter to apply paint or enamel to pressed wood panels and moldings. A sealing coat followed by an air-dry or baking type enamel or lacquer results in a smooth grain-free surface. The finish is superior to that possible with wood because of the freedom from grain, he explained.

The wood chips or sawdust is mixed with between 5 and 15 per cent Resinox, an industrial plastic resins and other ingredients. The mixed resin and wood goes into a mold by means of a blower-hopper feed or vibrator. The mold is in-

This Handy Selection Chart

Answers the Question...

A WIDE SELECTION OF SPEED
FOR USE WHERE SHAFT IS ACCESSIBLE
FOR USE WHERE SHAFT IS INACCESSIBLE
FOR MEASURING CYCLES OR VIBRATIONS PER SECOND OR MINUTE

"What Speed Measuring Instrument Shall I Use?"

The quick-reference selection chart and index, illustrated above, tells you at a glance which type of Biddle instrument to use for your particular speed measuring problem. This handy guide is but one of many helpful features found in a newly-published bulletin, which contains descriptions, illustrations, and other data on our resonant-reed, chronometric, and centrifugal types of high quality speed measuring instruments. We would be pleased to send you a *free* copy of this new Biddle bulletin with selector chart. Your request will bring it to you promptly. Simply ask for Bulletin 35-F.

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Electrical & Scientific Instruments

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serted into a press where heat ranging from 300 to 350 F and pressures of less than 200 psi are supplied. Depending on the thickness of the structure, the mix stays in the press from 3 to 15 min and comes out in a completely finished piece ready for use.

Calculating Worm Gear Efficiency

Contributed by
W. F. Schaphorst

APPROXIMATIONS of the efficiency of single reduction worm gears can be made in the following manner: multiply the reduction ratio by 0.0047 and subtract the product from 1. Thus for example if the reduction ratio is 50 to 1 we have: 50 x 0.0047 equals 0.235. Subtracting this from 1 gives 0.715 or 76.5 per cent efficiency.

The rule relates only the single reductions and should not be applied to a reduction ratio greater than 100 to 1. It is obvious from inspection of the formula, that at some point the rule would show an efficiency of zero and a simple calculation shows that this occurs at a ratio of 213 to 1.

As a matter of fact single reductions as high as even a 100 to 1 are seldom made because of the low efficiency. Better results can be obtained by using two reductions. As an example take a drive with a required ratio of 50 to 1 with a double reduction, the first with a ratio of 5 to 1 and the second 10 to 1. Applying the formula gives an efficiency of 97.7 per cent for the first reduction and 95.3 for the second reduction.

To get the overall efficiency it is necessary to multiply these two together, this gives an overall efficiency of 93 per cent. This efficiency of 93 per cent for the double reduction is directly comparable with the efficiency of 76.5 per cent for the 50 to 1 single reduction.

As an extreme example assume a required overall reduction of 2500 to 1. This can be obtained in several ways, but first assume a double reduction of 50 to 1 which we have already determined to be 76.5. A double reduction using the ratio of 50 to 1 would, therefore, be 0.765 x 0.765 or 58½ per cent. In other words nearly one-half of the energy would be lost in friction between the parts.

From the efficiency standpoint it would therefore be better to use a quadruple reduction. It has been shown above that combining a 5 to 1 and a 10 to 1 in a double reduction gives an efficiency of 93 per cent. Using two such reductions in series would give an overall efficiency of 86 per cent as compared with 58.5 per cent for the double reduction. The power saving of the quadruple drive is considerable, over 27 per cent of the input.

More Brains for Elevator Controls

Contributed by
Westinghouse Electric Corp.

THE ELECTRICAL "brains" of electric elevators, already amazingly talented, now have another factor to consider in making their "judgments" —cable stretch. For all elevators close leveling at the floors is desirable.

For freight elevators this is particularly necessary since heavy wheeled loads are often moved in and out. In some buildings the cables are long enough to stretch or shorten and let the car drop or rise an inch or two as a heavy truck enters or departs, possibly necessitating a releveling. Because the traction motor torque does not build up instantly, when the controller releases the brake to bring the car back into position the car may actually drop another inch or two or, if the load is light it may even rise a like amount.

A new control element, designed by Westinghouse, relevels the car automatically. A load weighing device and a control measures the load in the car and controls the release of the brake. For example, with a very heavy load the control would hold the brake on until the elevator motor had built up sufficient torque to relevel the car without further dropping; then it would release the brake and relevel.

Tile Sewer on Earth Base

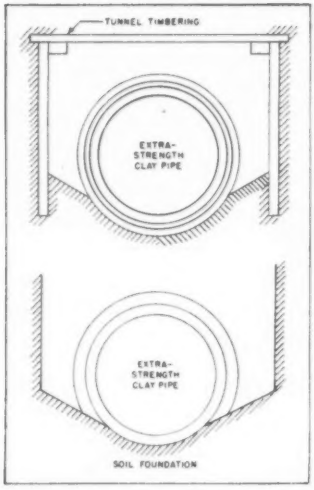


Fig. 1. This is a section of a clay tile sewer installed "in tunnel" as differentiated from "open cut." The foundation for the pipe is relatively undisturbed native earth having bearing power adequate to support the pipe

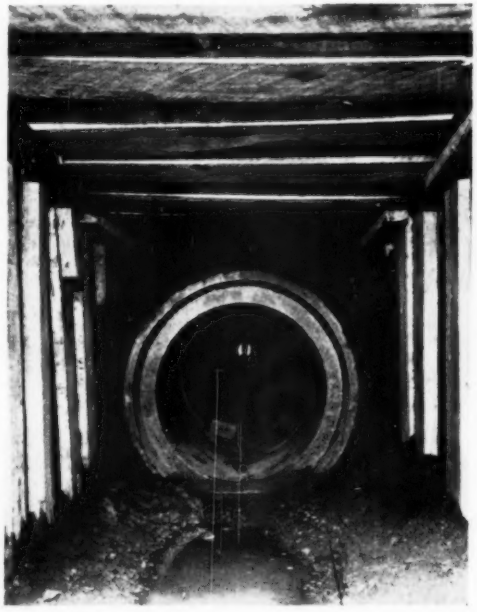


Fig. 2. The photograph shows an actual installation of this type of sewer. The foundation for the pipe is relatively undisturbed native earth having bearing power adequate to support the pipe installation. Tunneling usually is prohibitive in cost where the native soil is inadequate as foundation material. Hence it is almost axiomatic that native soil foundations in tunnel are good. Total load on pipe foundations "in tunnel" is much less than the load in equivalent "open cut" construction. Tunneling for sewers is generally more expensive than open cut and is only used where sewers are either very deep or where surface structures are too expensive to remove

New G-E Wiring System Offers Unlimited Possibilities In Modern Lighting Control

Multiple Switching from Many Locations Available at Low Installation Cost With G-E Remote Control

Switch your garage lights ON or OFF from any room in your home—in hospitals, give every patient a light switch next to his bed—in industrial plants and commercial buildings, let every night watchman have a centralized bank of switches for all lights in his area. These are just a few of the many possibilities that can be brought about by the new remote control system, recently announced by the General Electric Company.

Easy to Install

Using existing methods for wiring all power circuits, the General Electric remote control system requires no new materials or techniques except in the switching circuit itself. In this circuit a small, low-voltage relay does the actual switching. Control of this relay can be placed practically anywhere in a building, simply by installing lightweight wires from the relay to conveniently located wall switches, specially developed for this purpose. "Easy as wiring a doorbell," is the way one observer described this circuit.

Because this new system cuts the cost of materials used in multi-switch applications, because it makes possible a large number of controls on any individual circuit, General Electric remote control clears the way for wide use of multi-switch control in structures of all types.

Keeps Costs Down

In residential wiring, this new system means real "dream-home" electrical control even in residences where costs must be cut to the bone. Simple applications include the example of garage lights given above—also attic fan and cellar light controls in various parts of the house. In the completely modern house, all lights and outlets can be controlled from various locations.

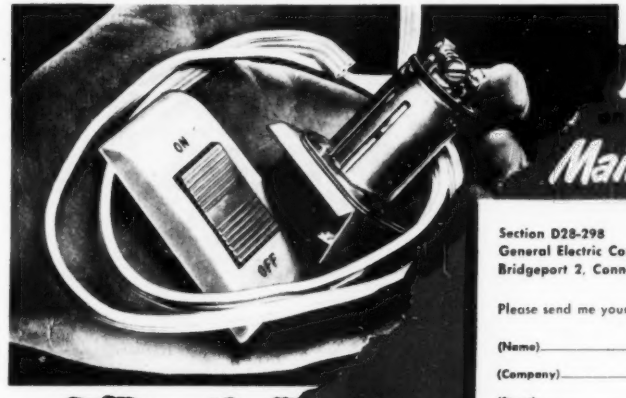
In dormitories, institutions, and commercial buildings, General Electric remote control can provide an effective centralized system for lighting control. Wherever "lights-out" regulations are in effect, a master panel of remote control switches can be used to enforce these regulations for an entire building or a whole floor. In commercial structures or plants, a similar system can be used to turn out lights left on after hours. Commercial and industrial operations can profit by the over-all multi-switch control offered by this system.

Offers New Ideas

To everyone concerned with building and remodeling, this new system offers a completely new range of ideas on flexibility in the use of electricity. To the architect, it means a new era in electrical convenience in structures of all sizes and types. To the buyer and the investor, it means increased workability and extra value, now and in the years to come. To the electrical contractor, General Electric remote control offers a vast, new field for his services.

To answer questions on the applications of General Electric remote control—to explain the procedure and the materials required—the General Electric Company has prepared an informative booklet on the subject. This booklet is a valuable guide for everyone interested in this new system. To get your copy early, simply fill out the coupon and mail it today.

Here are the essential components of the new General Electric remote control system: the switch, the small transformer (not shown), the relay, and the lightweight No. 18 wire. All accessories necessary for the system are manufactured by General Electric and sold through your General Electric Construction Materials distributor.



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GENERAL ELECTRIC

Questions and Answers

Protection of Hot Water Tanks

Contributed by
Ray Kavanaugh

UPON READING the problem which confronted K.J.M., I got in touch with Metallizing Engineering Co. and asked them just what would be the best approach to the problem. I received the following letter.

"We do not believe it would be practical to attempt metallizing a hot water tank with copper. Copper is inclined to be rather porous when sprayed and, therefore, would not protect the tank effectively against corrosion.

"However, we are happy to be able to say that aluminum has been sprayed very successfully onto hot water tanks and it protects the steel. There is one problem involved even here. The problem is this: If any copper piping or tubing is in the tank the tank can not be protected with aluminum due to the electrolytic action which is set up between the copper and the aluminum.

"If this particular tank is merely a storage tank for hot water and if it does not contain coils we see absolutely no reason why long protection from sprayed aluminum can not be expected."

Contributed by
B.W.J., New York

THE PROBLEM of protecting water storage tanks from the corrosive action of water is often difficult. In some cases the water can be treated chemically to make it comparatively harmless but even then the action of oxygen in the water may render simple treatment worthless.

The method of lining the tank with cement, as suggested by K.J.M., would, in my opinion, not be successful with tank water at 110 F. The cement would eventually become spongy and porous and would likely crack. It would be difficult to seal the cement around pipe connections and then, when the water penetrated to the back of the cement, the tank would be in worse condition than it was before the lining was applied.

In my long experience in caring for such tanks I have reached the conclusion that the best, most economical way to keep tanks free of corrosion and pitting is to clean them thoroughly at least once a year or oftener if necessary. Then the oxygen that forms under the pit bubbles will not have time to do much damage.

In addition to this advantage a closer watch can be kept on conditions inside and on the tanks, checks can be made on the degree of corrosion, the condition of the tubes, braces, seams, rivets, float valves, water level indicators and alarms. If all these things are attended to regularly the tanks will be free of trouble.

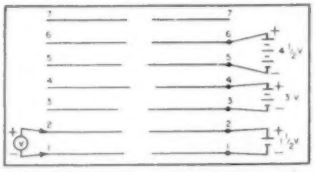
Uses Voltmeter on Brain Teaser

Contributed by
Lee J. Hindenburg

I DID NOT read the original "Brain-teaser" on wire tracing so there may be some limitation on the answers that will void this one. The solution as outlined below requires a high-resistance voltmeter and several dry cells. All the solutions I have read seem to assume that the ends of the wires are clear, that is: none connected to each other or to ground, so I will make the same assumption.

On the trip to the first manhole connect a dry-cell to any two wires and mark the negative wire No. 1 and the positive wire No. 2. The next two wires are connected to two dry cells with the wire connected to the negative side marked No. 3 and the one to the positive side marked No. 4. The next two are connected to 3 dry cells and marked 5 and 6, as above. The last wire is left open and marked No. 7.

Next comes manhole 2. With the voltmeter pickup the two wires which show a reading of 1½ v. The negative will be Wire No. 1 and the positive will be No. 2. Continue with the readings and marking for 3 and 4½ v. The wire to be marked No. 7 will show no reading. The voltage drop will be negligible and the system will work as well as a bell. It is true that the wires still have voltage on them but the other solutions left the wires connected together or to ground.—*The original "Brain Teaser" did state that the electrician was supplied only with a bell and a battery but Mr. Hindenburg has produced a simple and fool-proof method of identification. The Editors.*



This sketch indicates the finding of Mr. Hindenburg's voltmeter

Compressed Air System Leaks

IN THE NOVEMBER issue of this magazine F.N.B. inquired regarding means of checking a compressed air system for leaks without having to inspect every line, valve and nozzle throughout the plant.

Contributed by
Paul Wollner, Ch. E.

If the compressor is equipped with an automatic starter that cuts in at a certain minimum pressure and cuts out a definite maximum pressure all that is necessary is to connect an electric clock to the power line of your compressor. It should be connected so that the clock will start and stop together with the motor of the compressor thus indicating the running time of the compressor.

Multiply this running time in hours by the known capacity of the compressor during an hour period. This will give the approximate leakage in cubic feet during this period.

Contributed by
C. Hartenstine

1. Make a thorough check of the compressed air system to be sure that all outlets are closed and all leaks stopped.

2. Procure an accurate pressure gauge and place on air receiver.

3. Start compressor and pump system up to full operating pressure at which time either unload or shut down compressor.

4. Using a stop watch, check and see how much time is required for the pressure to drop 5 lb, 10 lb, 15 lb, then, knowing that the system is tight and all outlets are closed, this could be used as a standard for future checks. All that would be necessary would be to make sure all outlets are closed and then check the length of time required for the pressure to drop and compare with the standard of the original test. If the pressure drops rapidly as compared to the original test, it would indicate that a leak exists in the plant; if not, you know your system is tight.

This is an inexpensive way to make a check and is thoroughly reliable for all practical purposes. However, a flow valve could be purchased and put on the discharge line leading from the tank which measures the CFM passing through this line. This would give an accurate check, but is very expensive and from what you ask in your question, I do not believe would be required.

V-Belt Efficiency

(Continued from page 37)

pump through the Texrope Drive. You will note that at the rated capacity of a 125 hp the efficiency of this drive is 98.9 per cent. The segregation of the losses in a V-belt drive is a difficult procedure as there is no simple means by which these losses can be separated.

We know that in a properly designed and properly installed multiple V-belt drive, there is a loss of approximately ½ per cent due to creep. Creep, in this instance, can be stated as the change in unit length of the belt as the belt passes from the slack side of the drive to the tight side of the drive where the tension is increased. The only other losses in the drive are due to windage and friction and an extremely small loss due to the effort necessary to bend the belt and to pull it out of the grove. Both of these losses together constitute approximately ½ of 1 per cent.

New Products and Methods

(Continued from page 24)

to direct coolant, oil or air at the proper location.

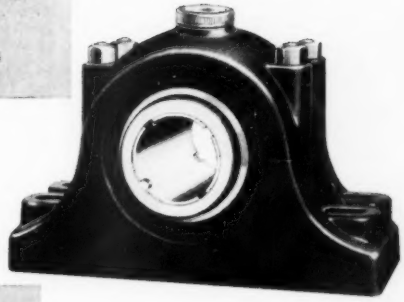
The Localube unit is designed to become a part of each machine that may use coolant, oil or air. It is held securely to the machine with three machine screws and is designed to allow ample flexibility to direct coolant, oil or air on the desired point of most efficiency. The tip end has a 3 in. long ¼ in. copper tube which can be bent if desired. Next to the tube is a flexible joint which operates on two ball joints constantly under spring tension which compensates for wear and assures good seating facilities. This joint is adjustable at approximately 90 deg in any position. The joint is attached

to ½ in. bent tubing which allows the unit to be mounted on the outside of the machine with the bend bringing the tip to the proper location in the center of the table. The ½ in. tube is held in position by a clamp which allows adjustment to be made for shorter or longer distances dependent upon the type of machine and the mounting location.

The clamp is mounted on the larger swivel ball joint incorporating the same characteristics as the double joint which also allows further adjustments of direction and take-up automatically of wear and tension.

The combination of all features permits the unit to be adjusted out of the way when running dry jobs and to be

Quality-proved by use on millions of industry's toughest jobs



Mounted, sealed, housed, fully assembled, ready to lock on the shaft

Delivered from stock in 4 basic types and a vast range of sizes

"DODGE-TIMKEN" MEANS QUALITY!

100-TON PULL

Three Dodge-Timken Pillow Blocks carry the load of a 100-ton pull of castings in and out of a shot blast chamber for the Falk Corporation, at Milwaukee. The bearings save the gear reducer from side pull and allow the shaft to turn easily even while taking the full load. Perfect operation for 8 years to date.

It was Dodge who took the famous Timken Bearing, mounted it, sealed it, housed it and delivered a pillow block of new high quality—fully assembled, ready to lock on the shaft and carry the power loads of industry with new efficiency.

Power savings, improved machine operation, reduced maintenance, elimination of spoilage and steadier production—all result so regularly from the application of Dodge-Timken Bearings that this great line is widely accepted as the standard for comparison in up-to-date power transmission layouts.

Ask the Transmissioneer, your local Dodge Distributor, how these bearings and other Dodge "firsts" can help you achieve better, more economical production.

DODGE MANUFACTURING CORPORATION, MISHAWAKA, IND.

OTHER DODGE "FIRSTS"

TAPER-LOCK V-BELT SHEAVES. Easy on—easy off—hold fast to shaft.

ROLLING GRIP CLUTCH. No toggles! Flexibility. Positive drive.

"SC" BALL BEARING Pillow Block with new Neoprene metallic-backed seal.

DODGE

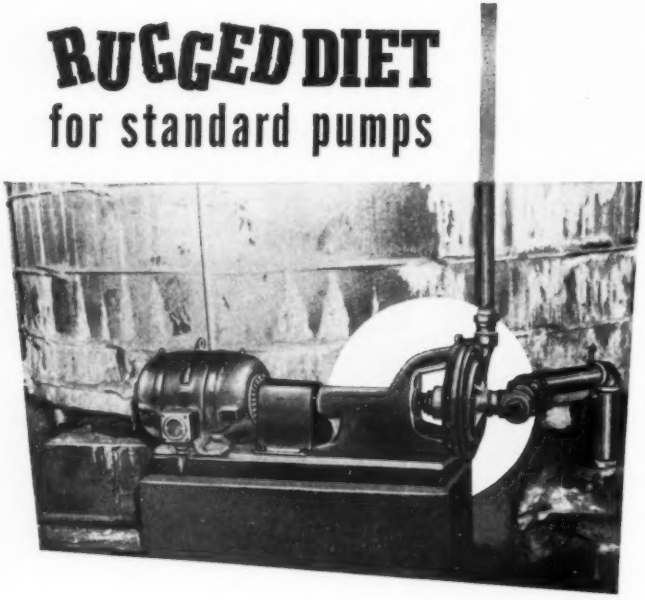
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER. Look for the name of the Transmissioneer, your local Dodge distributor, under "Power Transmission Equipment" in your classified telephone directory.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

RUGGED DIET for standard pumps



A standard Deming Centrifugal pumping lithium salt.

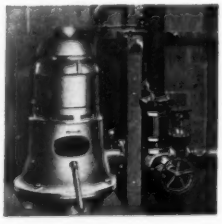
● A six-year diet of lithium salt had no serious effect on standard Deming Centrifugal Pumps in a Minneapolis chemical plant. According to the owners, replacement of parts has been negligible.

A total of 61 Deming Pumps of various types are used in this plant. Largest number are Deming Side Suction, Two Ball Bearing Centrifugals. Outstanding feature of these pumps is the separate liquid end.

This type of construction makes it economical to have only the liquid end parts of special alloys for pumping corrosive liquids. The support head can be of cast iron construction.

The advantages are two-fold: lower first cost and minimum costs of repairs or replacements on the separate liquid end parts.

View at right shows a Deming Deep Well Turbine Pump used for low cost water supply in the plant mentioned above. Deming Turbines are water lubricated. No oil or grease is required. Water supply is protected from contamination by such lubricants as none are used.



For complete information on Deming Centrifugal Pumps and Deep Well Turbine Pumps, write . . .

● THE DEMING COMPANY • 532 BROADWAY • SALEM, OHIO

DEMING
THE COMPLETE LINE
PUMPS AND WATER SYSTEMS

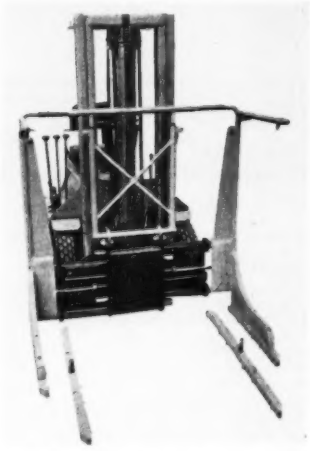
New Products and Methods

available when wet operations are desired by merely attaching the portable coolant system to the valve on the end of the unit, which is tapped for ⅛ in. pipe connection or by attaching air line for removing small parts from dies in press operations. Fostoria Pressed Steel Corp.

18—Load Grab Device

Latest addition to the recently developed Load-Grab attachment for palletless materials handling is a Box Clamp attachment for use with the company's Model "20" lift truck.

Adaptable to the standard hydraulic-controlled Load-Grab as optional equipment, it includes box clamp arms for grasping the load; sliding side support assemblies which may be adjusted



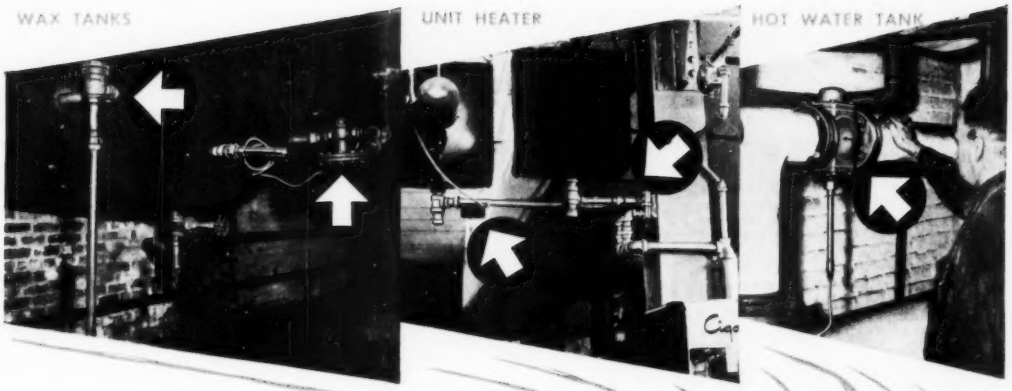
to fit boxes of varying size; and an overhead stabilizer bar to insure accurate stacking and keep the load from shifting or separating. Box clamp arms are regularly 27 in. long, but if desired, may be ordered in 42 in. lengths.

Like the standard Load-Grab, the box handler will carry loads up to 1,780 lb. The clamp arms will spread from a minimum 25 in. to a maximum 62 in. and may be lowered to ground level.

Intended for handling fruit boxes and crates or similarly packaged materials, this new device is one of several optional adaptations of the Load-Grab, including: spike-faced arms, rubber-faced arms, drum handling tines and conventional fork arms. The Hyster Co.

19—Battery Charge Indicator

To improve industry's habits in using the industrial truck battery and to prevent battery-operation in an overdischarged condition (frequent overdischarging shortens battery life) a new charge indicator which gives the momentary charge condition of the battery, and thus keeps the operator informed as to its state-of-charge



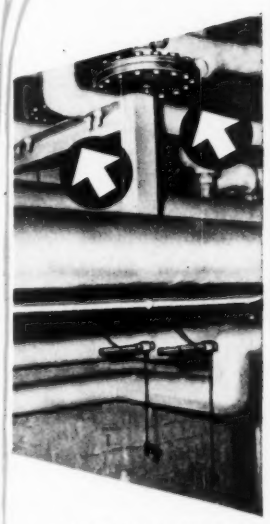
HOW SARCO SAVES FUEL

"I've been paying for Sarco Steam Traps and temperature controls for years in wasted heat. Thought I might as well have them and the other advantages too."

This statement was made by executives who knew the facts, but just "never got around to it."

Take the wax tanks illustrated. Tons of hot wax are stored, and poured into 100 lb. paper bags for shipment. Too cold—it won't run. Too hot, it burns or ruins the bags and wastes heat. The Sarco No. 9 Steam Trap at the left extracts all usable heat in the steam coils before it lets the condensate go. The Sarco Control at the right, holds the temperatures within a degree—and again, saves steam.

Unit Heaters start and stop at the command of Sarco Electric Controls. Hot water is held at correct temperatures in converters and tanks, or blended for wash water. Even fuel oil preheat is exact when an All-Sarco job is installed. These savings and many more are available through the Sarco Representative near you. Ask for Catalogs applying to your special conditions.



FUEL OIL PREHEATER

232

SARCO
SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
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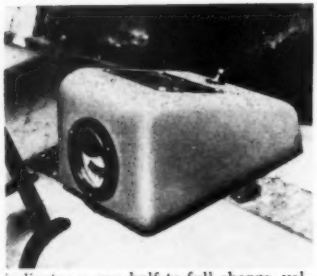
throughout the shift. The dash-board mounted instrument is distinguished by three major advantages: (1) lower cost than similar instruments (2) the ability to report the state of discharge at any instant rather than concealing vital information until the danger zone (overdischarge) is reached, and (3) tamperproofness against piece-work operators looking for the last half-hour pay at the expense of the battery.

The indicator is marked-off into four sections, each of a different color. Green



indicates a one-half to full charge, yellow a one-quarter to one-half charge, red a zero to one-quarter charge, and pink indicates the battery is being used in an overdischarged condition. A rugged all-aluminum case, designed specially for vertical mounting, houses the instrument. The gauge is read while the truck is actually in operation. Gould Storage Battery Corp.

20—Factory Lavatory

Two new lavatories, the Lavalux and Sanicor, are for use in industrial and commercial buildings, in schools and institutions, in hotels, and in other buildings where it is important that water be automatically shut off when not in use have been announced. Both are of easy-to-clean vitreous china, and controls are designed so that users can wash in running water without the necessity of filling a basin that may have been soiled by a previous user. A foot pedal controls the flow of water, and a hand valve mounted on the top shelf of the lavatory makes it possible to adjust the warmth of the running water to the most comfortable temperature. This is a distinct advantage over the conventional type of automatic-shutoff hand-operated faucet, which makes it necessary to run water into the basin or to hold open either the hot or cold control with one hand while washing the other hand.

Water is supplied through a single spout. The spout is equipped with a spray to prevent splashing when water is running. A pop-up plug, with operating handle at the back of the spout, is provided for filling the basin when necessary. Crane Co.

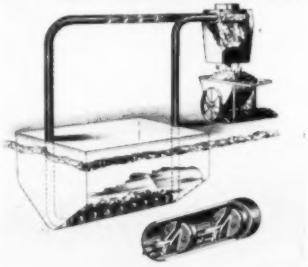
21—Bulk Conveyor

Elimination of manual labor in the bulk transporting of solid or fibrous material of a loose nature is one of the principal advantages of the Houdaille Conveyor.

A continuous, automatic materials transport, the conveyor will move any material which will settle to the bottom of a tank, hopper, bin or other form of reservoir. If the material has settling qualities, the Houdaille system can be adapted to any transportation problem of either production materials or waste products.

The Conveyor consists of a series of neoprene or cast iron flights, assembled on an endless chain. The chain and flights are pulled through a pipe casing by means of a high torque gear transmission. The casing, custom-bent to the specifications of the origin and delivery points is of 2, 4 or 6 in. diameter (other sizes are available when needed) depending on the capacity requirements of the particular installation.

The most efficient layout for the conveyor is determined by a preliminary



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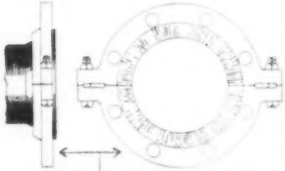
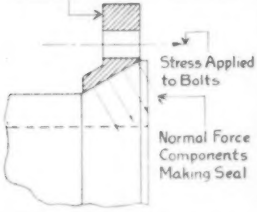
For Lower Cost Installation... Longer-Lasting Efficiency!



"FLANG-LOK" FLANGE



For all standard pipe sizes from ⅜" to 96" I.D., on fluids or gases under vacuum or pressure, at temperatures up to 250° F.

Quickly, easily installed with "FLANG-LOK" FLANGES. Split flange accommodates flared end of joint. Turn flange only (not joint or pipe) to align bolt holes with connecting flange.

Leakproof, rubber-cushioned seal. As bolts are tightened, rubber end of joint is compressed over broad area against connecting pipe. Magnitude of forces forming seal is in direct proportion to stress applied to bolts.

Superior strength, durability, safety. Special built-up construction, employing rubber, duck and metal, assures widest margin of safety against rated pressures.

Plain, efficient operating principle. All movement occurs in center corrugation. Width of corrugation determined by extent of movement required. Phone our nearest branch for further details or write for illustrated folder.

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Est. 1870

survey of requirements, and the pipe system then built to specifications of the approved layout. Using hydraulic pipe-bending machines, company engineers fabricate the pipe to provide a continuous length of easing conforming to any desired traverse. Structural design is such that chain and flight movement is smooth. The finished product is an individualized unit to solve the removal problem. Honan-Crane Corp.

22—Canopy Cutter

The Canopy Cutter—a hand punch designed to cut fluorescent fixture canopies to take 500 or 700 Wiremold raceway has been announced.

The addition of this cutter to an elec-

trician's kit, according to the company, will eliminate the tedious, often haphazard hand cutting of such canopies to accommodate Wiremold, and should be the means by which more and more fluorescent lighting jobs are wired the easy way. The Wiremold Co.

23—Dry Extinguisher

A handy dry chemical fire extinguisher containing two pounds of Ansul Plus-Fifty Dry Chemical has been designed for effective use by inexperienced operators. In the small extinguisher field, the "Emergency Fireman" is said to provide maximum protection for flammable liquid and electrical fires. It is rechargeable on the spot after use.

The dry chemical in the "Emergency

Fireman" is non-toxic, a non-conductor of electricity, non-corrosive and non-abrasive. It will not deteriorate, solidify or evaporate and therefore does not require periodic recharging.

The fill cap on the "Emergency Fireman" is built into the mounting bracket. This makes the extinguisher ready for instant use the moment it is removed from the mounting bracket. Ansul Chemical Co.

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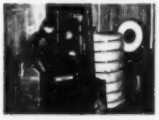
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If you can cut 20% to 30% from your present production costs with Towmotor Mass Handling—you will increase your profits. Towmotor Fork Lift Trucks, Tractors and Accessories reduce the cost of production and distribution by rushing raw materials to production lines and machines, speeding finished products to shipping, stacking full loads into overhead storage. Towmotor provides maximum handling capacity for every type of job, 24 hours a day, every day. Use Towmotor Mass Handling to reduce *your* production costs, to increase *your* profits. Use *Towmotor*, the Fork Lift Truck preferred by professional handlers everywhere.

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Bulletins . . . . Catalogs

Keep posted on current practice, learn what other plant engineers are doing. Know the how and why when the need arises. Mark the bulletins you want by number—or ask questions on specific applications—on the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 18 and 19 and 58 and 59

BUILDINGS AND MAINTENANCE

101 Aluminum Ladders—A new illustrated three-fold catalog devoted entirely to its line of aluminum fire ladders has been issued by this company. The catalog gives full specifications and prices for 62 pieces of equipment falling into eight classifications. Ranging from simple wall ladders to heavy-duty extension ladders, this equipment fills the requirements of small plant fire brigades or larger fire departments. Two of the ladders are widely used for industrial purposes other than fire fighting. Aluminum Ladder Co.

102 Versatile Quonset—This recently issued bulletin SSQ241 describes the versatility of the Quonset 24. Line drawings show how the basic building with solid end walls and open fronts is ideal for a loading dock, vehicle shelter and many other uses. Other line drawings show how sliding doors or combinations of sliding doors and closed fronts make the building weather tight. Complete description of the building is given. Views of actual installations are presented. Stran-Steel Division, Great Lakes Steel Corp.

103 Sound Control—This new publication titled, "Sound Control" covers noise quieting, acoustical correction and vibration isolation. The text describes the company's various products which have been successfully used in solving various problems of sound control. Typical installations are illustrated by photographs and there are construction details showing latest application methods. Also included is a listing of pertinent data on size, weight and sound absorption of the different materials recommended. Johns-Manville.

104 Movable Asbestos Walls—An excellent 24 page bulletin titled, "Transite Movable Asbestos Walls," has just been issued. This booklet is excellently done and contains many blueprint type illustrations and photographs of applications of the walls from industrial toilet compartments to research laboratory, office and other types of industrial buildings. Construction drawings show cross-sections of the unit and demonstrate how they are erected. The text covers latest information, data and specification suggestions. Johns-Manville.

ELECTRICAL

105 Fan-Cooled Motors—Nine outstanding features of this company's totally-enclosed fan-cooled motors are described in Bulletin 05B7150. According to the bulletin, the problem of efficiently removing heat losses without exposing electrical parts to harmful atmospheric conditions has been solved in these motors, which are available in squirrel cage, wound rotor and synchronous types, for vertical or horizontal installations. Typical installations are shown by photographs. Allis-Chalmers Mfg. Co.

106 Switchgear, Control Devices—Bulletin 25B7095 titled, "Switchgear and Control Devices," describes and illustrates rotary control switches, push button stations, generator voltage regulators, synchro-operators, current and potential transformers, oil and air circuit breakers and many other items. Types and ratings are supplied on the various equipment while standard wiring diagrams and photos of typical station combinations accompany the data on push button stations. Allis-Chalmers Mfg. Co.

107 Permanent Magnets—A new bulletin describing this company's high intensity perma-plate alnico magnet for removal of harmful tramp iron from food, chemicals, coal, feed, foundry sand and other materials, has just been issued. The bulletin, No. B-1205A, shows how the magnets can be installed in or above wood or metal chutes, ducts, pipes, hoppers, spouts, conveyor belts, and other places. Three types of magnets are shown: General Duty for farm and miscellaneous operations, Heavy Duty for most industrial applications and Extra Strong for difficult applications involving unusually heavy burdens or removal of large quantities of tramp iron. Dings Magnetic Separator Co.

108 Electric Motor Controls—Booklet 8 is an excellent, pocket size, 24 page booklet which is crammed full of information on application and construction of the company's various electric motor controllers. Much tabular material which presents ratings, sizes and other engineering information is included. Prices for the various items also are given. Furnas Electric Co.

109 Technical Catalog on Switches—Bulletin 4809 is a 68 page technical catalog, profusely illustrated, which gives full details on this company's complete line of enclosed safety switches, service entrance equipment, branch-circuit or residence panels, panelboards for light and power distribution and wireways and fittings. Specially featured in this catalog are valuable tables for the selection of switches, wire and fuse sizes for electric motors and other useful wiring data of value to engineers. General Switch Corp.

110 Stationary Batteries—Catalog GB-852 is a new 16-page catalog covering battery units for stationary service. Seven pages of the catalog are devoted to technical data and engineering specifications covering the 98 types in the company's line of stationary batteries. Capacities in ampere hours at standard and special rates, dimensions, weights and other data are tabulated in this section. The Gould Storage Battery Co.

111 Separation Magnets—A new 4 page illustrated Bulletin P-2001 on separation magnets has just been announced. The bulletin gives detailed information on the application, construction, selection and suspension of separation and road sweeping magnets. It also contains detailed data on field attraction and penetration, magnet dimensions, weights and lifting capacities. The Ohio Electric Mfg. Co.

FASTENINGS

112 Fastenings Handbook—Fastenings of stainless steel are completely covered in Catalog No. 48. This is an 80 page, thumb-indexed reference book which describes the various items of stainless steel fastenings in the company's line. These items include screw machines, nuts, bolts and cap screws, rivets, set screws, pins, nails and many others. Tables of sizes and list prices accompany the description and a supplementary stock list which shows the thousands of sizes and variety of analyses of stainless fastenings the company has on hand in addition to those shown in the pricing catalog. This book will make an unusually handy reference for any engineer who has to deal with stainless steel fastenings of any type. Anti-Corrosive Metal Products Co., Inc.

113 Industrial Fastening Case Histories—A new case history book, issued by this manufacturer of some 800 machines for stapling and wire stitching, is filled with brief stories of customer experiences, spotted with such headlines as: "Saved 75% Material and Labor Cost"; "Production Multiplied by Four"; "Twice as Fast as Glue and Tape." Marginal illustrations show such applications as: applying insulation; sealing protective wrappings and numerous others. Bostitch.

HEATING, HUMIDIFYING

114 Steam Humidifiers—Bulletin 1771 describes the company's steam humidifiers for automatically controlling relative humidity for the prevention of dry air damage to hygroscopic materials such as paper, leather, wood, cork, foodstuffs and other materials in storage or in process. The bulletin also describes the effect of relative humidity on human comfort and help and explains how maintenance of proper humidity will eliminate the fire and explosion hazards of static electricity where inflammable dust, vapors or liquids are present. Tables and charts are included on desirable relative humidity in various industries. Two useful sections of the bulletin are "How to Select," and "How to Install," both of which are accompanied by excellent line drawings presented in two colors. Armstrong Machine Works.

115 Selecting Steam Traps for Unit Heaters—This company has just issued an 8 page bulletin, Form 190, explaining how to select steam traps for unit heaters by the Btu rating method and the condensate weight method. Charts, tables and data in the bulletin include listings of the Btu outputs under standard conditions of all sizes of unit heaters produced by 24 different manufacturers; conversion tables for determining Btu output of unit heaters under varying conditions of pressure, temperature, entering air temperature and fan speed; and tables showing recommended sizes of the company's traps for draining unit heaters of given Btu capacities. Recommended installation diagrams are also included. Armstrong Machine Works.

116 Gas Burner Data—Bulletin 7C describes this company's packaged industrial gas burner assemblies which are complete with pressure blowers. Capacities, specifications, dimensions and alternative assemblies are described for these units which are said to be applicable to boilers, air heaters, dryers, kilns, ovens and other equipment to which open burners with control flames are suitable. Industrial Div. Bryant Heater Co.

117 Industrial, Commercial Boilers—"Meet the Titusville Boiler Family," is a new 4-page bulletin featuring illustrations and enginering drawings of the company's line of industrial and commercial boilers. Steam generators and three and four drum water tube pressure boilers are showing in engineering detail drawings. One page illustrates and describes other available literature on specific types of the company's boilers. The Titusville Iron Works Div., Struthers Wells Corp.

118 Tubular Heat Exchangers—Bulletin 916 is a particularly informative 32 page bulletin which has just been issued. The bulletin describes the present designs of the company's tubular heaters, coolers, condensers and heat exchangers and their distinctive features. The various types of shells, tube bundles, stationary heads and floating heads are fully explained, together with statements of the particular services for which each is suitable. An additional helpful feature of the bulletin are tables of the characteristics of tubing, the thermal resistance of tubes and pipes of many different metals and alloys, and the specific gravity and pounds per gallon corresponding to degrees Baume and degrees API. Also presented is a chart of the specific heats of midcontinent crude oils and the charts for solving the MTD formula with correction factors for other than counter-current conditions. The Griscom Russell Co.

INSTRUMENTS

119 Resistance Testers—Included in this new Bulletin 21-20 are clear and easily understandable descriptions of the Megger heavy-duty insulation resistance testers and accessory features with ample illustrations, charts and diagrams. Hand-driven, motor driven and multi-voltage instruments, their features, ranges and applications are detailed in a manner which should simplify the selection of proper instruments for specific insulation resistance measuring problems. James G. Biddle Co.

120 Pressure and Vacuum Gauges—This new catalog 7000 describes the full and complete line of instruments such as indicating and recording pressure gauges, recording flow meter and pressure gauge, air operated controller, non-indicating pressure controllers, indicating furnace pressure controller, precision pressure regulator, etc. Also featured in this catalog are pressure actuating elements, high vacuum gages and other items. The catalog is well illustrated throughout its 31 pages with clear schematic drawings, photographs and diagrams, and also presents pressure range charts and indicating scales. The Brown Instrument Co.

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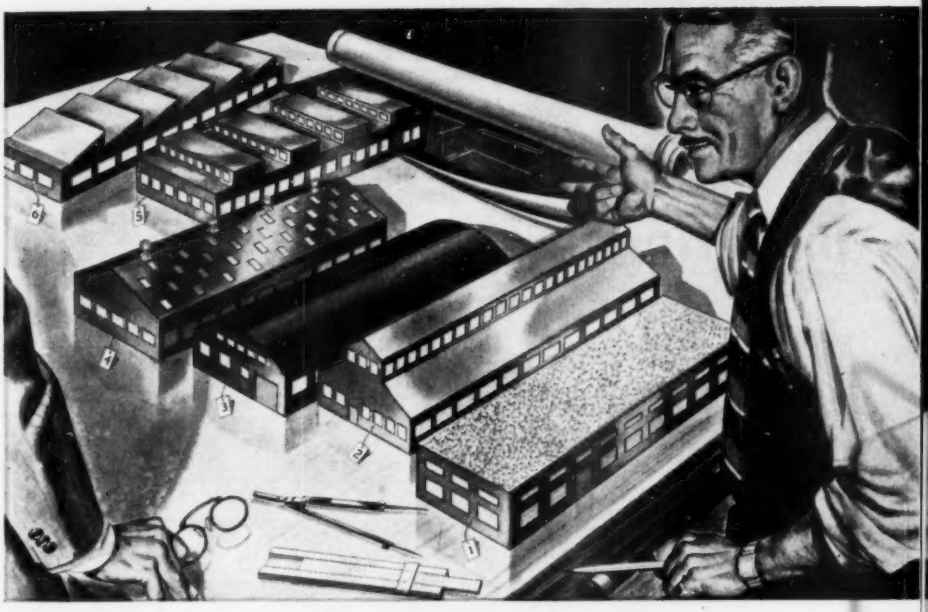

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121 Travel Log for Vehicles, Machines—This 4 page bulletin tells about a registering device that is used principally on production machinery and commercial vehicles. When used for the former the instrument records pieces, yards, revolutions, etc., which are produced or which should have been produced by the machine when it was running; speed at which the machine operated; number of shutdowns or stops; duration of each shutdown. The operator writes in a space provided on the chart the start of each run or lot; the reason for each shutdown, such as repairs or job change and other pertinent information. On commercial vehicles the instrument records: Mileage between stops and total mileage; average speed of vehicle; number of stops made; duration of each stop; and engine hours. The driver writes: The start of each trip; the reason for each stop; and the finish of each trip. Other pertinent information, such as interstate crossings also can be entered. The instrument is completely described in the bulletin and descriptions of its operation, construction, mounting and other data are given. Knopf Instrument Co.

122 Temperature Measuring Instruments—For all those responsible for the safe operation of electric power equipment, this company has just issued a revised 34 page Catalog ND4-33-461 describing the company's instruments for measuring the temperature of generators, motors, condensers, transformers, etc. The bulletin covers a wide variety of instruments, portable and automatic indicators, for checking in any order on temperatures. Reference also is made of new and specialized instruments for measuring in rapid succession a number of bearing temperatures. Leeds & Northrup Co.

123 Flow Charts—New air and hydraulic pressure and flow charts that provide much useful data that would otherwise require laborious calculations are now available from this company at no obligation. The charts contain easy-to-read, attractively laid-out data tables for fast convenient reference. One table gives push and pull stroke pressure in pounds for various cylinder sizes with various piston rod diameters, at pressures from 50 to 3000 psi. Another table shows pipe sizes necessary for well designed hydraulic circuits and indicates friction pressure loss for various pipe sizes and conditions of pipes and losses in various fitting valves. Miller Motor Co.

124 Insulation, Resistance Testers—Bulletin 1248 describes this company's line of Megohmer insulation and resistance testers. The booklet presents complete specifications and also shows photographs of each item in the line and on the back page of the four page folder, it shows a supply of "Megographs" which are furnished free with all Megohmers. Herman H. Sticht Co., Inc.

LUBRICATION

125 Maintaining Insulating Oils—Titled, "The Modern Way to Clean, Stabilize, Dehydrate and Degasify Transformer and Circuit Breaker Oils," this 4 page illustrated bulletin describes a self-contained unit which improves all dielectric to as high as 35 kv, prolongs oil service life and increases transformer capacity. Details of construction and case histories are included in the bulletin. The bulletin points out how volatile corrosive acids, air and moisture are removed, resulting in stronger resistance to sludging and emulsifying. Bowser, Inc.

126 Air Compressor Lubrication—This is the Second Edition of this excellent handbook on Air Compressor Lubrication. The booklet contains 40 pages and starts off with a description of various makes of air compressors complete with cutaway views of the unit for both stationary and portable compressors. The book has been broken into logical sections, such as intercoolers and aftercoolers, air receivers, rotary compressors, turbo compressors, lubricating systems and compressor oils. One complete section deals with the lubrication of the running gear. A chapter on operating hints and oil requirements of

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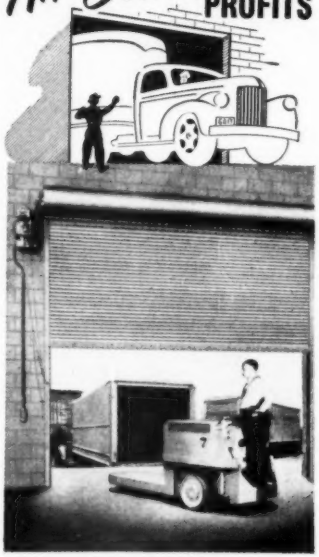

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air cylinders is included. The entire booklet is exceptionally well illustrated and will prove to be a handy reference handbook for engineer's library. Cities Service Oil Co.

127 Lubricating Chart—Many engineers are finding helpful answers to the question "What lubricants to use and Where?" in a new lubrication chart issued by this company. The chart contains specific recommendations on 139 different classes of industrial machinery. Adams Cook's Sons, Inc.

128 Clean Oil—The latest issue of "Clean Oil" tells how the company's oil purifier does a good job for Kaiser-Frazer, Chefford Master, Boston Towboat Co. and Omaha Public Power District. Descriptions of the various ways in which the purifiers are used in these plants are given and drawings and photographs illustrate the stories. Honan-Crane Corp.

MACHINERY PROTECTION

129 Vibration Prevention Handbook—This excellent bulletin titled, "Why it Pays to Anchor your Machines with Unisorb," is a series of case studies showing how various investigations have isolated vibration of machinery by the use of felt absorption pads. Descriptions of the uses of these pads include the amount of savings in time and labor and a complete description of how the material controls vibration and noise. The illustrations used in the booklet are large and clear and locations of the vibration absorbing material are clearly indicated by colored circles. An exposition of how the material reduces maintenance cost and why it costs less to install it is included. Further applications of the material are listed on the last page of the 20 page booklet. The Felters Co.

130 Machinery, Piping Protection Service—This bulletin describes the company's services in the protection and corrosion proofing of piping and machinery against chemical or corrosive action. The bulletin points out that the company's service starts with a study of specific conditions to be overcome and the development of the correct formula for solving the particular problem. Equipment or piping to be treated can be treated in your own plant or in the plant of the engineering company. Data on corrosion resistance of the various products in the company's line which are used for coating are listed and a listing of the various types of industries and corrosives which these products will protect against also are given. The Gates Engineering Co.

MATERIALS HANDLING

131 Storage Rack Systems—A proved means of substantially increasing the actual capacity of available storage space without new construction is presented in this Bulletin 4873. The booklet is profusely illustrated with installation views of barrel and drum racks and skid racks, showing how storage capacity has been multiplied several times in various establishments by utilizing overhead space efficiently. Line drawings show how large amounts of floor space are rendered available for production operation after the racks are installed. The bulletin contains full information on the characteristics of the storage rack, including arc welded steel construction which provides maximum strength without excessive bulk or weight, easily adjustable runners and other features that facilitate handling. Barrett-Cravens Co.

132 Continuous Weighing of Dry Materials—Bulletin E4-550 describes the company's new meter for continuously weighing and totalizing the flow of dry materials on conveyor belts. The meter can also be used for the automatic proportioning and controlling of dry or liquid feeders for secondary ingredients. The bulletin describes how the device operates, how it is constructed and gives various features. A double page spread, printed in two colors, presents a typical installation of the unit on a belt conveyor. Blueprint type drawings illustrate various applications for the continuous weighing and/or controlling and proportioning flow of dry or liquid materials. Builders-Providence, Inc.

133 Inspection and Care of Chain—This new booklet titled, "Inspection, Care and Use of Alloy Steel Chain," includes a check list of things to look for when inspecting chain in your plant; factors that enter into and govern the proper use of chain; a plan for assuring your chain the necessary care; a table giving the maximum wear limits for each diameter of chain; the safe working load limits of each size of chain and the correct methods of repairing. S. G. Taylor Chain Co.

MECHANICAL POWER TRANSMISSION

134 Fluid Drive Electric Power Units—According to this new bulletin 8519 you may now order power in a package. A complete new hydraulic electric power unit ready for installation has been announced with units ranging from 1 to 20 hp. It is pointed out by the manufacturer that this unit allows the user to get the benefits of lowest starting current, motor acceleration, overload protection and shock absorption in this new fluid drive. This is particularly suitable on all hard electric motor jobs, such as conveyors, centrifugals, mixers, winders, spinners and other machines where low starting current, move acceleration and other factors are highly desirable characteristics. The bulletin is exceptionally well illustrated showing tests which illustrate the smooth and effective acceleration and other important advantages of the drive. One page is completely devoted to ratings and dimensions of the unit. American Blower Corp.

135 More Horsepower Per Dollar—This 8 page bulletin tells how the company's Worm Gear Speed Reducers save money in various specific applications. Nearly every page of the bulletin is devoted to one installation of the unit in such places as operating a pebble mill for grinding

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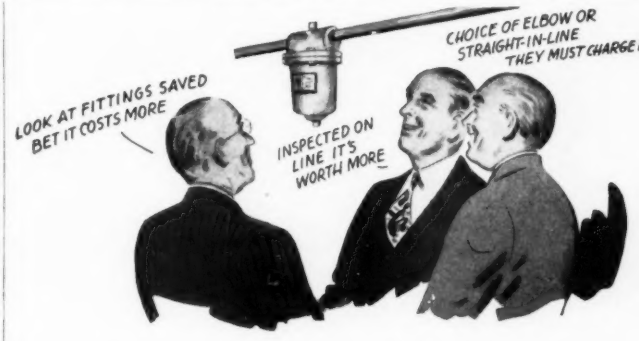
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enamel; trim conveyors; mine conveyors; driving a stainless steel propeller in a bleachery tank; etc. The booklet is well illustrated and is printed in two colors. The Cleveland Worm & Gear Co.

136 Gear Motor—This new brochure No. 3-200 describes the company's latest gear motor. Besides describing and illustrating this new model the catalog shows foot and flange mounting of the unit and includes complete dimensions, assembly positions and a tabulation listing torques, speeds, gear ratios and overhung load capacity. Janette Mfg. Co.

137 Speed Reducer Handbook—Catalog 70 is a 128 page, heavy paper bound booklet which deals completely with the company's line of speed reducers. Details of design and construction of the units are presented along with explanations of service factors and rating tables. The service factors and rating tables are given in a section following. Selection of reducers, method of rating reducers, typical examples covering selection of herringbone reducers and tables of horsepower ratings are given. These sections are well illustrated with line drawings and photographs of typical installations. The catalog section gives complete information on the entire line along with assembly diagrams and information which is necessary for selecting reducers and for reference in ordering machines. W. A. Jones Foundry & Machine Co.

138 Automatic Production Control — A new 16 page booklet entitled, "Reeves Automatic Production Control" will be of particular interest to machine users and designers. The booklet is fully illustrated with photographs and drawings and it discusses in detail the function of automatic production control and the means of applying it to production machinery through the use of the company's variable speed transmission and motor drive in conjunction with the company's automatic controls. Among the items described in the booklet are hydraulic automatic control, mechanical automatic control and differential automatic control. Reeves Pulley Co.

139 Hydraulic Power Transmission Bulletin—This bulletin describes the company's Hydro-Sheave Drive, a new hydraulic power transmission unit designed for immediate application to electric motors and internal combustion engines in the $\frac{3}{4}$ to 25 hp range. An excellent cutaway illustration of the unit shows the various features and working parts. Description of the drive is included in the bulletin and photographs and descriptions of applications are presented. This is Bulletin No. 145. Twin Disc Clutch Co.

PUMPS, COMPRESSORS, ENGINES

140 Pumps, Condensers—This bulletin is a condensed catalog of the products, plants, facilities and services of this company. A concise description of the services offered by nine divisions of the company are presented in the bulletin and a summary of the combined services and products offered by the various units is given on one page. A listing of the general maintenance service and bulletins and catalogs which are available from the company also are presented. A handy cross-index of products in industries served is given in an exceptionally useful cross-indexing chart which occupies a full page. Condenser Service and Engineering Co.

141 Flexible Tubing for Diesel Installations—Bulletin 71 is an 8 page booklet which describes the various flexible metallic tubings for use with Diesel installations on fuel lines, air lines, oil lines, water lines and exhausts. Tables of characteristics for the various types of tubing are presented and the various types also are illustrated. Pennsylvania Flexible Metallic Tubing Co.

142 Centrifugal Pumps—Form 4301J describes the company's single stage, enclosed impeller, ball bearing, belt and motor driven centrifugal pumps. Sectional views of the pumps accompany materials

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of construction tabular listings, along with pages of specifications and performance charts. Performance selection tables assist in selecting the proper units. The last page of the 8 page booklet is devoted to dimensioned line drawings and tabular material. Gould Pumps, Inc.

143 Pump Maintenance—Metallizing saves money in the maintenance of pumps according to the new easy-to-read November issue of "Metco News." To help the readers solve their pump maintenance problems, this issue shows the savings possible by metallizing a wide range of pump parts, both centrifugal and reciprocating. It tells how owners of metallizing equipment are restoring such pump parts as shafts, hubs, rods, plungers, pistons and sleeves. As an example, one user of metallizing reports savings of $2475 in one year. Metallizing Engineering Co., Inc.

144 Steam Engine Governor Data—This new Bulletin No. 502, describes the company's Type EN fully enclosed self-lubricated governor which is described as giving "precise, dependable engine speed control." Illustrations of the unit are presented and a parts list, accompanied by a sectional diagram is given. One section "Installation and Care" tells how to assemble governor to engine cylinder and how pulleys should be proportioned, the proper type of belt for use with the governor, correct lubrication procedure, method of packing and other data. Troy Engine & Machine Co.

VALVES, PIPING

145 Valves Bulletin—A new catalog section 12-H describes all types of the company's cast steel pressure-seal bonnet valves. Information on choosing the best size valve for your service is given in one page of the booklet under the title, "Correlation of Valve Size and Pressure Drop." Design and construction advantages of the valves are given and tables of pressure and temperature ratings. Details of design including operating mechanism, body design, disk piston, and other features are explained. Dimensional details are given in tabular form accompanied by dimensioned line drawings. A standard materials specification table is presented. Edward Valves, Inc.

146 Lubricated Plug Valves—Reference Book 39—Section 5, describes this companies self-sealed lubricated plug valves. A sectional washed drawing of a typical valve is shown with various features pointed out. The principle of the valve is explained by means of line drawings and list prices and characteristics are shown in tabular form. One section "Ways to Lubricate," is illustrated with excellent photographs which are accompanied by explanatory material. Homestead Valve Mfg. Co.

147 Safety and Relief Valves—Catalog No. 80 contains 24 pages and is bound in a separate heavy paper cover. The line of safety relief valves described are designed for the protection of boilers, compressors, heat exchangers, kettles, pressure piping and vessels, process equipment and regulators. Each of the various items are illustrated and the accompanying text tells the service for which the valves are designed, gives their service range, sizes available, connections and other pertinent information. Sectional views of each of the units is presented. Marine & Industrial Products Co.

148 Corrosion-Proof Shut-off Valves—Engineering Report No. 94 provides performance data on over 1200 positive shut-off valves in service over 5 years on highly corrosive and highly penetrative fluids. Included are applications of hydrofluoric acid, propane, organic fluorides, general hydrocarbons, etc., of various temperatures and pressures. The report describes the development, application and design characteristics of the valves and includes tabular data on valves in service complete with operating temperatures and pressures. Sellers Injector Corp.

MISCELLANEOUS

149 Ring Packing Technical Bulletin—This new Technical Bulletin, TB-918, comprising 12 pages, describes the company's line of ring packings and tells where they are used and how they are used in such places as hydraulic cylinders, hydraulic shock absorbers, wheel brake cylinders, swivel fittings and others. An excellent section shows how the ring packing operates and describes features of design. Tables of recommended dimensions for the rod type and the piston type are given. Greene, Tweed & Co.

150 Retaining Rings—Catalog 201 is a comprehensive specifications data book which describes the company's retaining rings. Illustrations show how the retaining rings are used on various types of bearings and other moving parts. Photographs show how the rings may be installed, and tables of dimensions and ring numbers are given. One section of the book shows how to assemble the external rings in ball bearing assemblies and how to assemble the internal rings. This section is illustrated with step-by-step illustrations. Spirolox Div., Ramsey Corp.

151 Forgings—One of the most comprehensive reference data booklets on the subject of forgings is this new 44 page catalog titled, "The Improvement of Metals by Forging." The booklet describes in detail these various types and characteristics of forgings and discusses important considerations in designing for forgings, information of particular value to the specifier of forgings. Tables present complete information on the characteristics and application of commercial forging metal. The Steel Improvement and Forge Company.

152 Welding Accessories Handbook—This new 12 page bulletin, Form No. 7, contains valuable information about the maintenance and care of electric welding cables, connections, grounds and holders. Furthermore, it illustrates the company's complete line of electrode holders, ground plans, cable connectors, terminal connectors, cable splicers, and carbon electrode holders. A new 6 bracket quantity price schedule and parts information is included. Tweco Products Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 18 and 19 and 58 and 59

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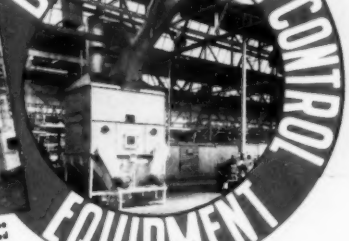

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Handbook of Specifications

National Directory of Commodity Specifications. Department of Commerce, National Bureau of Standards, Miscellaneous Publication M 178. Size 8 by 10½ in.; 1184 pages, plus an index; cloth bound. Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price $4.00.

Supplement to National Directory of Commodity Specifications. Miscellaneous Publication 178. Size 8 by 10½ in.; 299 pages, plus an index and the name and address of the standardizing agencies. For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price $2.25.

THIS IS THE Third Edition of the National Directory of Commodity Specifications, first published in 1925, and revised for the first time in 1932. It lists and briefly describes standards and specifications of various trade associations and organizations representative of national practice, as well as the standards and specifications of the government agencies that represent the Federal Government as a whole. Included, also, are references to the purchase specifications of several departments and establishments of the Federal Government.

More than 35,000 specifications are included, broken down to decimal classification involving 10 major groups. A great number of standards listed is evidence to the extent to which they have become an aid to industrial and commercial enterprises.

The Supplement to the Directory was issued in order to bring the material up to date and take account of changes, revisions and improvements that have been made since the completion of the Directory itself two years earlier.

Motor Starting Code

Single-Phase Motor Starting Current Rules. Size 8½ by 11 in.; 6 pages. EEI Publication No. Q-8. Published by the Edison Electric Institute, 420 Lexington Avenue, New York City. Price 25 cents.

THIS PAMPHLET is a report of the Joint Committee on Motor Starting Currents and consists of two parts. Part I, 3 pages, consists of single-phase motor starting current rules; and Part II, the Appendix, gives the bases of the recommendations of the discussion of voltage flicker due to motor starting and the effect of motor starting currents and permissible secondary lengths, and relative costs of distribution system designed to limit flicker.

Applied Welding

Design for Welding edited by R. S. Green. Size 5½ by 7½ in.; 1020 pp plus index; illustrated; copyright 1948; cloth bound. Published by the James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio. Price $2.00 in the U. S.; $2.50 elsewhere.

Abstracts of 82 award papers in the Foundation's recent Design for Progress Award Program. In general, these papers deal with the design for an application of welding in all branches of industry. Selection of papers has been made with the objective of providing engineers in industry with a variety of ideas which may be adaptable to their own products or structures. There is a liberal presentation of cost data on the various designs to afford a sound means for comparison.

An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.

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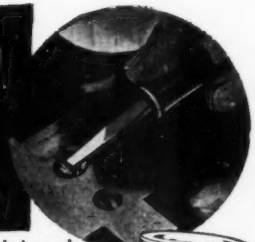

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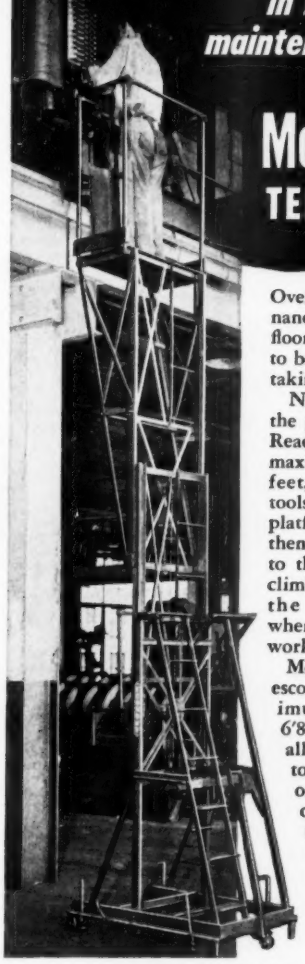

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Chemical Hints and Kinks*

The Chemical Formulary by H. Bennett. Size 5½ x 8½ in.; 428 pp plus index; Volume VIII; 1948. Published by the Chemical Publishing Co. Inc. Price $7.00.

This is the eighth volume of a series of chemical formulae compiled by authorities and experts in each field of industry. These cover all the latest commercial methods and processes. Each volume contains formula which are new and different and information is not repeated from volume to volume. The book furnishes the name and quantity of each ingredient, and explains fully the steps to follow in the production of the finished product.

A valuable part of the book is the "Trade Name Chemicals" indicating where they may be procured and giving a list of some 1200 sellers of chemicals and supplies.

The volume is divided into 22 sections. Those of most immediate interest to industrial concerns being: Adhesives; emulsions; insecticides; fungicides and weed killers; leather treating preparations; lubricants and oils; construction materials; metals and their treatment; paint, varnish and lacquers; plaster, rubber and resins; polishes; soaps and cleaners; and, textiles.

In it may be found such things as: Wood and crack fillers, antitack coating for asphalt tiles; solutions for softening rubber articles; metal polish; diamond dust abrasive; waterless hand cleaner; paint spot removers; metal treating solutions; acid proof cement; wettable DDT powder; insect killers; leather dope; wire rope lubricants; metal rustproofing solutions; tinted paints, plus many other formulas of practical application use to plant engineers and other maintenance and operating men.

Construction Guide

Abridged Building Code. Size 8½ by 11 in.; mimeographed, 139 pp including 6 appendices. Published by the Building Officials Conference of America, Inc. 51 East 42nd Street, New York. 17, N. Y. Price $5.00.

After months of effort, the Conference has approved and released this Code as a suggested model building code for smaller communities. It establishes minimum requirements for safe construction of buildings and structures for dwelling purposes, smaller businesses and community buildings. It is also recommended to banks and financial institutions, architects, engineers, and builders generally for guidance in the design of safe, economical and standard building construction.

Larger buildings which involve structural steel, reinforced concrete, or more involved designs, will be covered in the Basic Building Code which is now under study by the Board of Consultants but has not yet been approved.

The Abridged Code has been prepared sufficient flexible form to adapt itself to new developments in the building industry and permit the use of alternate materials and methods of construction which are approved as adequate for the intended purpose.

The Code covers in detail: Design, construction, alteration, demolition and moving of buildings and structures, and their service equipment. This includes such factors as: safety considerations; design for live loads, footings and foundations; construction types of all kinds; weather proofing, rat proofing and termite protection; plumbing, heating, refrigeration and air conditioning equipment; fire protection; electrical equipment and wiring; and, fire extinguisher equipment. The appendices give: A list of accredited authoritative agencies; accepted engineering practice standards; fire resistive ratings of walls, partitions, columns and assemblies, construction details; and recommended nailing practice.

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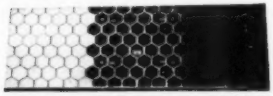

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GARLOCK 117

Heating Air Conditioning*

Heating, Ventilating and Air Conditioning Guide, 1948, 1280 pages, 6 by 9 inches, illustrated, cloth; published by the American Society of Heating and Ventilating Engineers, 51 Madison Avenue, New York, 1948. Price $7.50 per copy.

THIS twenty-sixth volume of the Heating and Ventilating Guide like its immediate predecessor is composed of several sections. It contains first a technical data section of reference material on the design and specification of heating, ventilating, and air conditioning systems based on the transactions of the American Society of Heating and Ventilating Engineers, the investigations of the ASH & VE research laboratory and co-operating institutions, and the practice of the members and friends of these societies. The volume also includes a manufacturers' catalog data section containing essential and reliable information concerning modern equipment, the roll of membership of the society, and complete index to technical and catalog data sections.

The technical data section is divided up into eight major divisions. Section 1 is devoted to fundamental principles, that is to terminology, abbreviations and symbols, thermodynamic theory, fundamentals of heat transfer, performance of heating and cooling coils, natural ventilation, instruments and measurements and so on. Section 2 is devoted to the subject of human reaction to atmospheric environment. Heating and cooling loads are discussed in section 3. Section 4 is devoted to the general subject of combustion and consumption of fuels. Section 5 concerns heating systems and equipment, it contains descriptions of all the various types of heating systems in common use today. Section 6 is devoted to the general consideration of air conditioning, to dehumidification, refrigeration, air distribution, sound control and owning and operating costs. Section 7 is devoted to special applications, that is, to the industrial air conditioning, drying systems, transportation air conditioning, marine heating, ventilating, air conditioning, and corrosion and water formed deposits causes and prevention. Section 8 is devoted to the installation and testing codes.

Business Management*

Managerial Control of Business by George T. Trundle, Jr., and S. A. Peck. Size 6 by 9 in.; 402 pages; illustrated and indexed. Published by John Wiley & Sons, Inc. Price $5.00.

THIS IS ONE of the first books on management techniques ever written by expert practitioners. It covers the entire field of business management from a strictly practical point of view. A book for business men and management in general, it will help managers to understand the practical philosophies to operate a business. It demonstrates the application of sound management principles in a clear-cut, easy to read manner.

This book gives guidance which will enable any business executive and his personnel to carry out the functions ordinarily restricted to a highly specialized management and controlled group. The editors establish in the first section of the book a review of the problems that confront typical manufacturing operations. The remaining four sections cover the best ways of attacking and solving these problems. Those functions of primary importance in any plant—maintenance, production control, labor control—have been treated as specifically as possible. Mr. Trundle is President of the Trundle Engineering Company and was first employed as a designer by two motor car companies. From 1904 to 1907 he worked as an experimental engineer for the National Adding Machine Company. He has held positions as tool designer, chief engineer for the American Multigraph Company, Chairman of the Fuse Manufacturers Association, and has continuously studied management and industrial procedure, mechanical and electrical engineering, accounting, etc. The other writers are all members of the Trundle Engineering Co.

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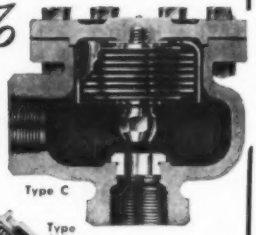
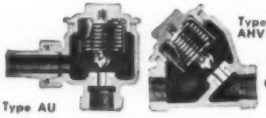
PRODUCTION INCREASES UP TO 30%

2 to 6 Times More Drainage Capacity Speeds Circulation





Bulletin 1047 or see Sweet's

Plant records show that the unequalled drainage capacity of Nicholson thermostatic steam traps increases production up to 30%. Other reasons why an increasing number of leading plants are standardizing on Nicholson: operate on lowest temperature differential, 5° to 15°, depending on trap size and steam pressure; record low for steam waste (as low as 1%). 5 types for every purpose: sizes ¼" to 2"; press. to 225 lbs.

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Valves ★ Traps ★ Steam Specialties

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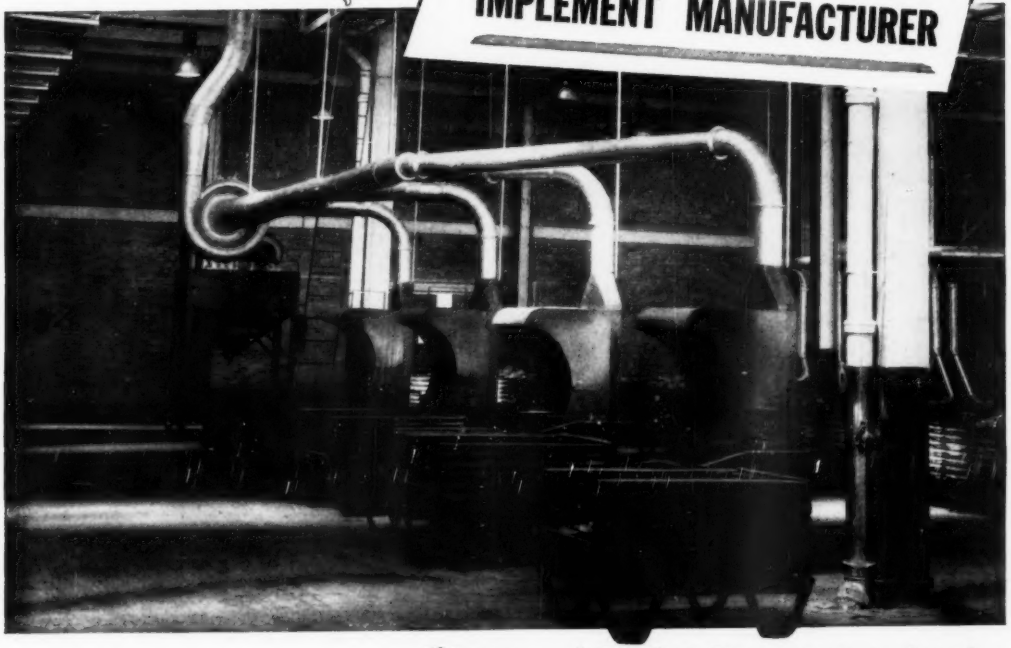
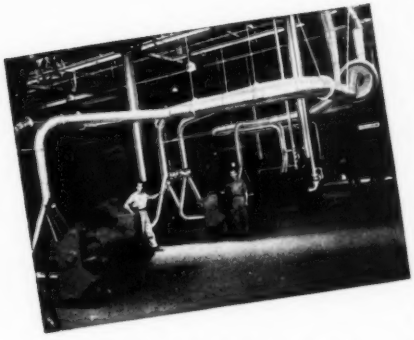
"CHIPS fall where they may?"

..but NOT IN PLANT OF NOTED IMPLEMENT MANUFACTURER





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Chipping and Grinding Departments equipped with KIRK & BLUM Dust Collecting Systems . . .

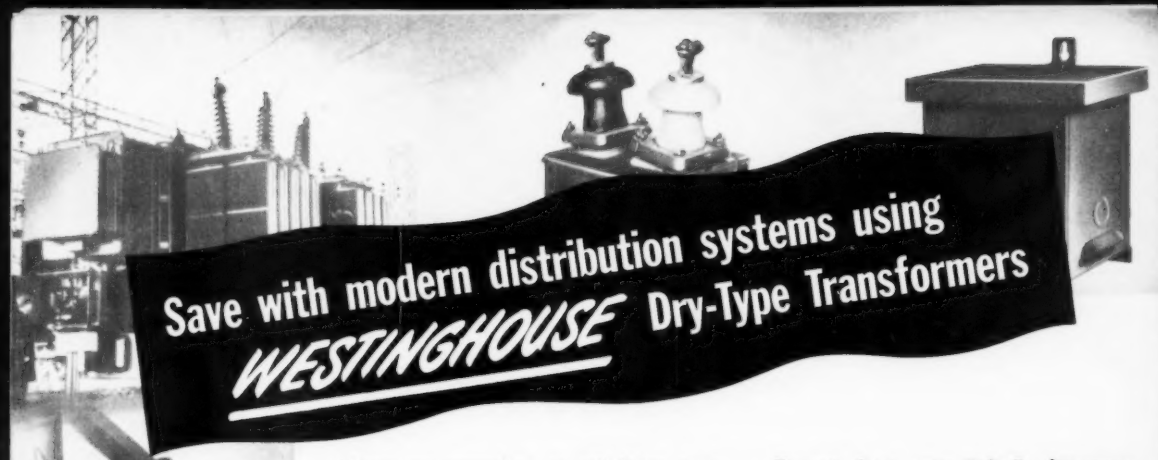
● Today's modern foundry places more and more emphasis on efficient dust collection. A newly constructed Southern foundry containing the most advanced equipment was recently placed in operation by one of the nation's largest manufacturers of farm equipment. Part of the chipping and grinding department of this foundry is illustrated here.

● This noted firm realizes that clean air means greater production, happier and healthier workers, less maintenance and replacement costs on motors and other equipment.

● Besides the systems shown here, KIRK & BLUM built and installed a variety of other systems for dust and fume removal. If you are considering building or remodeling your plant, you can profit from Kirk & Blum experience on this and hundreds of other jobs. Write for free booklet "Dust Collecting System in Metal Industries." *The Kirk & Blum Mfg. Co., 2889 Spring Grove Ave., Cincinnati 25, Ohio.*

FOR CLEAN AIR... THE [redacted] TOOL

KIRK AND BLUM
DUST CONTROL SYSTEMS



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If you are expanding or relighting your plant, you can lower operating costs and gain greater efficiency feeding motors and lights by using a modern distribution system.

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SAVE COPPER
SAVE INSTALLATION COSTS
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And Westinghouse dry-type transformers will give you additional advantages of **SMALL SIZE AND LIGHT WEIGHT,** important to the men who actually install the transformers.

To get these extra "plus" advantages, Westinghouse leadership in engineering introduced Class B insulation and developed HIPERSIL*, the steel that carries one third more magnetic flux.

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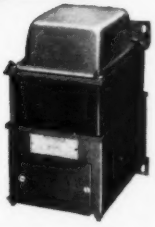
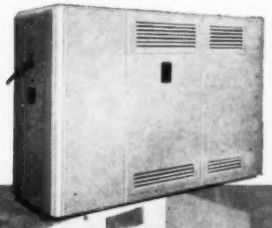


A NEW FEATURE—Two popular dry types, AJR and AVR, are now offered with or without a built-in circuit breaker. With this new feature, the need for separate protective devices is reduced. AVR-B (with breaker) is shown at left.



ABOVE—Type GP which, with type MT, are small, class A insulation transformers serving loads under 2 kva.

LEFT—Dry-type power center, used indoors as part of modern industrial distribution.

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